

MUNICIPAL JOURNAL AND ENGINEER

VOL. XVII

NEW YORK, NOVEMBER, 1904

No. 5



A. PRESCOTT FOLWELL
President

ELEVENTH ANNUAL MEETING OF THE AMERICAN SOCIETY OF MUNICIPAL IM- PROVEMENTS*



GEORGE W. TILLSON
Secretary

By George W. Tillson, Secretary

THE eleventh annual meeting of the American Society of Municipal Improvements was held at St. Louis, Mo., October 4, 5 and 6. Notwithstanding the fact that the membership of this association consists of officials from the leading cities of the United States and Canada, it has not achieved the numerical success which its important work warrants. The work of the society has been carried on during the past decade with eminent success, so much so that officials from some of the prominent cities of Europe have applied for membership, and its Annual Proceedings are sold in all parts of the world. It seems to me that municipal officials cannot be aware of its objects or the work it is doing, otherwise its meetings would be more largely attended.

This society was organized in 1894 for the purpose of bringing together municipal officers, socially and technically, in such a way that the officials of one community might know what was doing in another and so profit by the mistakes as well as the success of their associates.

Probably in no class of engineering work is there less concert or uniformity of action than in municipal work. This is due, to a certain extent, to difference in ideas, but mainly because the engineers of one city do not know the practice of others. Nor is this difference confined to the engineering features of the government, but extends to all. How often one reads of certain officials being sent out from a certain city to make a tour of the country to ascertain what is the practice in other cities regarding certain specific work. Another year the same city may send other officials to look up other subjects.

Now if the officials of the different cities were banded together in a society to meet once a year and present papers on special subjects and exchange ideas on general practice, it is easily seen how unnecessary such procedure, as outlined above, would be.

All persons who have been members of the American Society of Municipal Improvements for the last few years appreciate fully the value of its work. The tenure of office in many of our American cities is often so short that an individual can not long maintain his membership. But city governments go on, no matter under whose administration, and the incumbent of any office can retain the membership. If the governing bodies of cities would recognize this and keep their membership, the value of so doing would soon assert itself. The cities of Cincinnati, O., Newark, N. J., and Toronto, Can., have for a long time maintained a large delegation in the above society.

This society has standing committees to collect data and furnish papers on Street Paving, Electric Street Lighting, Sewerage and Sanitation, Waterworks and Water Supply, Taxation and Assessment, City Government and Legislation, Disposition of Garbage and Street Cleaning, Municipal Franchises, A General Review of Municipal Work done in the Current Year, and special committees on Municipal Data and Statistics and Park Development and Maintenance, all subjects of vital importance to every live and growing community. During the life of the society papers have been furnished on these subjects by men who are recognized as authorities, and who have told of deeds performed and not of theories advanced. Some of these are George H. Benzenberg, of Milwaukee, Wis.; N. P. Lewis, of New York City; Robert E. McMath, of St. Louis, Mo.; E. A.

* Any one wishing to know more about this Society and its work can secure such matter, as well as application blanks and terms of membership, by communicating with its secretary, Mr. George W. Tillson, Chief Engineer of the Borough of Brooklyn, Municipal Building, Brooklyn, N. Y.—[EDITOR.]

Fisher, of Rochester, N. Y.; Charles H. Rust, of Toronto, Can., all past presidents of the society. Besides these there have been papers by M. R. Sherrerd, of Newark, N. J.; Prof. A. N. Talbot, of the University of Illinois; Prof. A. Prescott Folwell, of Lafayette College, and many more equally distinguished.

The data and information furnished in these papers have been of such a character that it would have cost thousands of dollars for any municipality to have produced it.

When it was proposed to have the 1904 meeting at St. Louis, many of the older members were opposed to it, thinking that it would be difficult to keep the members at the meetings when the attractions of the Exposition were so great. But the attendance at all the sessions comprised nearly all members present in the city, and the absent ones were generally attending some other technical meeting on the Fair grounds in which they were particularly interested.

At this meeting there was a paper read by Mr. C. C. Brown, editor of *Municipal Engineering*, of Indianapolis. Mr. Brown is one of the oldest members, and his communications are the result of ripe thought and practical experience. His subject was "The Influence of Citizens' Associations on Public Improvements."

Another paper was "The Pollution of the Passaic River," by Ernest Adam, engineer in charge of Street Pavements, Newark, N. J.

A paper which attracted much attention was "The Sewerage System of Little Rock, Ark.," by Walter F. Reichardt, Assistant City Engineer of Little Rock. This paper very clearly demonstrated the best way of *not* doing things, as the description of how the present sewer system of Little Rock has been constructed could hardly be realized by engineers who had for years been living and working under organized systems. As usual in this society the pavement question received a great deal of attention.

Mr. F. A. Kummer read a paper on "The Testing of Wood Paving Blocks." This is an important subject, as

wood is again coming into use as a paving material, and it seems to be the general impression that if properly treated the blocks will make a satisfactory pavement. Mr. Kummer's paper was well received and very generally discussed.

Mr. W. H. Broadhurst, chemist of the Department of Public Works, Borough of Brooklyn, presented a description of the Municipal testing laboratory of that borough. The apparatus was described in detail and exact figures given as to the cost of the same. At a time when so many cities are discussing the propriety of installing such a laboratory, this article was very pertinent.

Mr. H. N. Ruttan, City Engineer of Winnipeg, Manitoba, gave an account of the construction and operation of the Municipal Asphalt Plant, which has been so successfully used for some years in Winnipeg. The article covered cost of original plant, maintenance and operation. The figures proved that under good management a municipality can lay an asphalt pavement as well and as cheaply as a private corporation.

Prof. A. Prescott Folwell presented a very interesting article on "Losses in Underground Municipal Structures." This paper produced more discussion than any other one read at the meeting, as it opened up new channels of thought, which will doubtless bear fruit at later meetings.

Mr. T. Chalkeley Hatton, of Wilmington, discussed in detail the "Municipal Water Supply" in such a way as to evoke much discussion from the different members.

Another interesting paper was that by Mr. E. S. Rankin, Engineer of Sewers, Newark, N. J., on "The Use of Sulphur for Sewer Pipe Joints in Wet Trenches." This was an entirely new subject and the cost of making such joints, as well as their advantages over cement, were carefully shown.

The above will give a general idea of the scope of the society, and it is considered that in almost every case the writer is not only an author but an authority, their value will be recognized.

LOSSES IN UNDERGROUND STRUCTURES *

Including Street Paving—Expense of Repairs—Loss from Gas Leakage—Damage by Water Leakage

By Prof. A. Prescott Folwell

THE author has recently completed the uncovering of some miles of water and gas pipe and replacing the pavement, and while doing so was again forcibly impressed by the enormous loss and inconvenience caused by ordinary municipal and corporate methods of constructing and managing street surface and sub-surface structures. While this is a matter of more or less common knowledge, it is one of the most serious unsolved problems confronting mu-

nicipal engineers and boards of public works, and it is probably only the apparent hopelessness of remedying present conditions which causes them to be tolerated as they are. The sources of loss are herein considered separately, but possible remedies are considered for all of them taken collectively, for the reason that it seems probable that no remedy can be found for one or two only which will be effective, even for these. In fact, the attempt to treat each by itself is probably the chief reason why no acceptable results have yet been obtained by water, sewer or street boards or commissioners in preventing these waters; and one of the objects of this paper is to call to the attention of the overseers of each class of improvement the interdependence of them all in this matter, with the hope that by

* This paper was read by Prof. Folwell before the American Society of Municipal Improvements, held at St. Louis, Mo., Oct. 4th, 5th and 6th. The Society elected him as its president for the ensuing year. The Annual Proceedings of this Society will soon be published. Copies for the current and past years, as well as information about the Society and its work, may be had by addressing the secretary, Mr. George W. Tillson, Municipal Building, Brooklyn, N. Y.—[Editor.]

co-operation a common satisfactory solution may be found to all of the difficulties in a considerable number of cases.

Most of the losses to be referred to can be classed under four heads: I. The destruction of street paving by constant digging up of the streets. II. The cost of the digging itself and replacing the pavement whenever the sub-structures must be got at. III. The losses due to leakage of gas. IV. The loss of water by leakage. There are incidentally minor losses and inconveniences, such as the thawing of water mains and service pipes; the interference with traffic caused by excavations; difficulty of access to and ignorance of the exact location of service connections and other appurtenances; the great confusion of pipes so intricately placed beneath the streets of large cities, etc.

I. PAVEMENTS

Secretary Tillson, in his work on "Street Pavement and Paving Materials," says: "It is almost impossible to repair any opening in a pavement so that it will be as good as before disturbance," and we all know this to be a fact. It is not that it is not done, but that it is not practicable. The remedy does not lie entirely in being more strict with those disturbing the pavements. No pavement is now in use which can be patched without causing humps or depressions which will diminish the serviceability and hasten wear, and weak spots in the foundation causing after settlements are apt to be numerous. This undoubtedly results in a financial loss both in the pavement and to traffic, the former of which can best be expressed, perhaps, in terms of the shortening of the life of the pavement, but which it is difficult if not impossible to determine definitely. I believe most authorities would admit a reduction of at least 15 per cent. to 25 per cent. in the serviceable life of each section patched. The loss to vehicles might be expressed as a negative gain from the improved paving; that is, if the pavement which has been torn up and replaced is but three-fourths as much an improvement on previous conditions as if it had been left intact, then one-fourth the cost of that improvement has been lost. If the pavement were found to last four-fifths as long as if undisturbed, and meantime to have but three-fourths its full value as an improvement, then the disturbing of that pavement has caused a loss of 40 per cent. of its construction cost. The loss to vehicles may not extend over the entire surface when but one or two trenches are dug longitudinally, but the shortening of life does, since the pavement must be renewed as a whole and not by patches. (Asphalt can be patched with better success than other pavements, but on the other hand the patching generally costs more). I believe 30 per cent. of the cost of city pavements would be a conservative estimate of the loss due to disturbing them—50 to 75 cents a square yard, or say \$2 to \$4 a lineal foot. If this loss be distributed over the life of the pavement and this be assumed at sixteen years (on the basis of twenty years of life if undisturbed) we have 12.5 to 25 cents per year per foot as this loss.

As to the amount of such disturbance. In New York in 1896 one mile in four was torn up for construction purposes, and one opening requiring repairs for every forty feet of paved street. In Brooklyn, during the same year, one open-

ing was made for every seventy-five feet of paved street. In Boston, in 1897, in about 500 miles of paved streets, there were 14,017 separate openings, about one to every 185 feet, with a total length of openings of 213.4 miles. In Chicago, in 1902, 20,200 permits were granted to tear up pavements, resulting in about 200,000 square yards of disturbance, or one opening to each 340 feet of street. Records of smaller cities are difficult to obtain, but with the spread of wire conduits and steam heating to small cities and towns (which already have sewers, water works and gas), all agree the destruction of pavements is increasing rather than decreasing.

II. COST OF DIGGING

This of course depends largely upon the size of hole necessary, but probably no opening costs less than \$3 to \$5 plus the cost of replacing the paving. This last will cost, if properly done, about as much as the original paving, even when most of the material can be used again—say at least \$1.50 per square yard for all pavements on a concrete base, and 50 cents for macadam. In Washington, D. C., the cost of taking up and replacing the paving for street openings during one year, on about 125 miles of streets (100 of which were asphalt and ten asphalt block) was \$47,594.83, or \$380 per mile, or 7.25 cents per foot.

Assuming one opening, costing \$4 for excavating and back-filling, for each 100 feet of street, gives 4 cents per foot for this. Probably 8 to 15 cents a lineal foot of the entire street surface would not be an excessive estimate of the cost of excavating, where the pavement is properly returned.

III. GAS MAINS

It has been estimated that "in good practice the normal leakage of gas mains is 225,000 cubic feet per mile per annum for an average diameter of six inches. It is frequently twice that amount; in some instances it is three or four times greater. In American practice leakage ranges from 10 to 30 per cent. of the output." (James C. Bayles, League of American Municipalities, 1902). In 1898 353 plants reported to the U. S. Commissioner of Labor a leakage of 7.3 per cent. to 14.7 per cent., 163 of these more than 14 per cent. and all but twenty-six more than 11 per cent. If we assume that gas costs an average of 40 cents in the mains, and a leakage of 200,000 cubic feet per mile per year, this gives a loss of \$80 per year per mile of main, or 1.5 cents per foot. Unfortunately the greatest loss due to leakage of gas does not always fall upon the gas company, but is found in the destruction of asphalt pavements above such leaks; in many fires of "unknown origin," but attributed by insurance companies to gas leaking into cellars and basements from the ground (the freest outlet when street surfaces are sealed with concrete); in explosions and asphyxiation of workmen in sewers, a large part of the "sewer gas" to which this is attributed being generally illuminating gas; and in the illness of individuals and shade trees.

IV. WATER MAINS

Much has been written about waste of water by consumers; not so much about loss from the underground mains and service connections. Mr. Dexter Brackett, reported to the Metropolitan Water Board (Boston and vi-

cinity) in 1904 that "The tests which have been made in the several municipalities of the Metropolitan District tend to show that the leakage from the street mains and services is very large, and that from 10,000 to 15,000 gallons per mile of street main escape each day into the ground or into some underground channel." In one town of this district 24,000 gallons per day was found to leak from 1,000 feet of main—a rate of 130,000 gallons per mile. Different authorities consider that an average of from 500 to 3,000 gallons of water leak from each mile of well laid main daily. Taking the average of poorly laid and well laid, probably 5,000 gallons is well under the actual amount in the average plant. At 5 cents per 1,000 gallons as the average cost of putting water into the mains, this means a loss of \$91 per mile of pipe, or 1.7 cents per foot.

For the sake of brevity few data have been introduced to substantiate the above statements and assumptions, but they are all based upon reliable reports and investigations, and probably any member of this society could find in his own city indications, if not proofs, that they are conservative.

These four losses as estimated above total 22.5 to 45 cents per lineal foot of street per year. This is of course a general average, and some cities may be so fortunate as to suffer much less loss. But the author believes there are more in which these figures are exceeded in the business sections. There are the additional considerations of the annoyance from tearing up of streets and from odors of gas, and objections to water waste other than financial ones, and others previously mentioned.

The correction of each of these objectionable conditions without a radical change of the entire system of underground structures has probably progressed nearly as far as is practicable; but with more care joints of sewer, water and gas pipes, and the house services of each (in which much if not most of the leakage frequently is found) can be improved upon. For instance, a small box might be placed over every corporation cock, and goose necks always used; tarred pipe could be rigidly excluded from gas mains (the author has seen a great many tarred specials used in these). Also service connections could be run to the curb opposite every building lot from sewer, gas, water and heat mains just previous to repaving and at no other time. But there would still remain the tearing up of streets for laying new mains, for repairing leaks, thawing frozen pipes, etc.

The most serious loss, that in connection with the paving, can be somewhat lessened by having all tearing up, back-filling and repaving done by the city, at a fixed price which the corporations desiring the excavation should pay. It would not then be necessary to bring pressure upon and await the delays of the corporations responsible for remedying the faulty relaying of a pavement, but all paving and repairs would be under the immediate supervision of and attended to directly by one city department. This is probably the best solution of an undesirable state of affairs, and has been adopted by several cities.

The only solution which can be adopted as satisfactory will be one in which the paving will never need to be torn up until worn out; in which all pipes, wires, etc., can be laid without interfering with the paving and be readily in-

spected at any time, this being true of service pipes and wires as well as mains. The paving can be preserved by not permitting either private corporations or city departments to lay any mains under the streets, but compel them to purchase right of way along private property, or else reserve strips of public property—such as alleys or strips between the sidewalk and the street (the latter of which would be interfered with by shade trees)—under which all such would be laid. But the other disadvantages are not remedied in this way. To meet them all a general conduit seems to be the only solution, with small branch conduits for the service lines. It seems probable that the model city of the future will have such conduits, throughout its business section at least, where pavements are most expensive and such structures most numerous. In them would be placed the small sewers of the separate system, water, gas and steam-heating mains, while in the walls of hollow tile could be run the telegraph, telephone and other wires. St. Paul already has something similar to this in its sandstone sewer tunnels, as has Paris in its sewers. Nottingham and St. Helens, England, comparatively small cities, have had such conduits for several years. In Chicago sixty miles of tunnels for wires have been built, the trunk tunnels 12 2/3x14 feet, the branches 6.5x7 feet. If a private company can do this for its own wires only, it would seem to be still more practicable financially when all the above can be provided for. The advantage of such a conduit is not confined to the annual savings if the structures it contains can be originally laid in it, thus saving the excavating and repaving, which would otherwise be necessary. This would amount to not less than 75 cents a foot for each structure, or \$3 a foot for four—as sewer, water, gas and steam. (In the centers of the larger cities the number of various pipes, etc., would be several times this). An electrical conduit in a business section costs \$2 to \$4 a foot or more (26 cents per duct foot on an average). Therefore, even in a city of small size—say 25,000 to 60,000—the saving of \$5 to \$10 on construction would be effected. The loss of 22.5 to 45 cents per foot capitalized at 4 per cent. would give \$5.56 to \$11.25 per foot, or a total of say \$10.50 to \$21.00 per foot. The conduit offers other advantages besides these financial ones; such as facility of inspection of all pipes, etc., and exact knowledge of the location and condition of each service connection. Also freedom from freezing of water mains, and ease of thawing if frozen.

The weak point in this argument, and probably one of the principal reasons why more cities have not built these conduits, is that before they are really necessary several of the pipes have already been laid in different parts of the street, and instead of saving much of the cost of laying, the use of the conduit requires the relaying of all of them, or of all but one, round which one the conduit may be built. But in spite of this it would seem as though some such a contrivance is a necessity if we are to construct and maintain good paving, and that the time is coming when any city which can afford a brick, asphalt or modern wood-block pavement must afford to first place under it a conduit which will preserve it from premature disfigurement, deterioration and renewal.

TESTS FOR WOOD PAVING BLOCK *

The Extensive Use of Properly Treated Wood Paving Block Makes Standard Tests and Specifications Necessary—Foreign Experience Noted

By Frederick Arnold Kummer, C. E.

The question of tests for wood-paving block is one which is comparatively new to municipal officials, owing to the fact that pavements of this class have not, until very recently, been extensively used in this country. Their use, however, has increased so largely during the past few years that the question is one demanding attention. Numbers of streets have been paved with blocks manufactured from excellent material, carefully treated and laid, which have given such satisfactory results that those interested in city paving are naturally inclined to predicate the success of such pavements in the future upon their undoubted success in the past; but it should not be lost sight of that the great prejudice which has existed against wood pavements in this country during the past twenty years arose from the use of blocks of poor material, improperly treated and laid, and there is exactly that danger existing as a possibility to-day—namely, that municipalities may lay, with every confidence in their probable life, blocks for street-paving purposes which are not made either of suitable material or properly treated. To avoid this we must have some means of distinguishing between good blocks and bad blocks, between blocks which are certain to repeat the experience shown by satisfactory service tests or blocks which may fail to do so. This is, of course, more likely to be the case as the increase of the use of this form of material naturally induces numbers of persons to go into the business, who, either because of lack of experience and knowledge in making such blocks, or lack of honest intentions in manufacturing them, may successfully secure municipal contracts for large amounts of work with material which may not in any way justify expectations. This difficulty cannot be overcome by dealing with those companies whose records show their ability and willingness to turn out good material, because of the system of competitive bidding, but as a manufacturer of blocks of this character, the writer unhesitatingly maintains that the more accurate the tests for determining those qualities in paving blocks which are most desirable to insure successful results, the better the effect upon the industry at large and the more satisfactory to those sincerely endeavoring to turn out first-class material. For these reasons it has suggested itself to the writer that some uniform specification and some standard method of testing should be adopted which will fairly bring out those qualities in paving blocks which are most desirable and which will eliminate, so far as can be done, inferior grades of material.

These notes are merely for the purpose of suggesting some of the lines to be followed. The writer, as member of

the Committee on Standard Tests for Road Materials, of the American Society for Testing Materials, hopes to be able to render some assistance later in the matter of formulating standard tests for wood paving block.

In approaching this question it should perhaps be borne in mind that, as a rule, there is not much individual difference in paving blocks treated by any particular method; provided a standard quality of lumber is called for, it is not possible for the manufacturer to make any considerable variation between one block and another. They are unlike, let us say, vitrified paving brick, in this respect, where bricks from one portion of the kiln are hard and from another portion soft, and where the question of inspection and culling determines the quality of the material, and where even a single carload may vary 50 or 100 per cent. within itself. Wood paving block, when treated, must, through the nature of the treatment itself, be all treated alike in any one individual charge, and these charges usually run from 300 to 400 square yards of pavement at a time, so that it is not so much a question of distinguishing between individual blocks as to which is good and which is bad, but more a question of determining whether the particular process to which the block is subjected is a desirable process and whether it is being carried out.

The question of determining the quality of lumber of which blocks are made can be done at the plant when the blocks are being manufactured, or can fairly well be done after the blocks are received on the work, which is a matter of simple inspection and need not be dwelt upon here. The question, also, of whether the treatment is carried out to the requirements of the specifications may also be readily determined by inspection at the plant, or more easily in the case of specifications requiring complete impregnation of the wood, by the simple expedient of either splitting individual blocks open to see whether the treatment extends to the heart, or by placing them in water to determine whether they will sink or float, it being a well-known fact that blocks thoroughly treated throughout with creosote or a creosote mixture will sink in water. If half a dozen samples from different parts of a boat or carload pass this test, it is practically certain that the cargo as a whole is equally well treated. It remains, therefore, to determine by some form of tests, which can be conducted in the laboratory, whether the blocks, either samples or specimens taken from those shipped to the work, are in accordance with the specifications, and this brings us to the question of what the specifications themselves should be. The following specification for wood paving block is one prepared by our Honorable Secretary, Mr. George W. Tillson, for work of this class in the Borough of Brooklyn, City of New York, the provisions of which follow:

"(1) The wearing surface shall be composed of long

* This paper was read by Mr. Kummer before the meeting of the American Society of Municipal Improvements, held at St. Louis, Oct. 4th, 5th and 6th. It will soon be published by the secretary. The Annual Proceedings for the current and past years, as well as information about the Society and its work, may be secured from the secretary, Mr. George W. Tillson, Municipal Building, Brooklyn, N. Y.—[EDITOR.]

leaf, all heart, yellow pine blocks, treated as hereinafter described. All blocks shall be of sound timber, free from bark, sapwood, loose or rotten knots, or other defects which shall be detrimental to the life of the block or interfere with its laying. No second-growth timber will be allowed.

"(2) The blocks are to be treated throughout with an antiseptic and waterproof mixture, at least 50 per cent. of which shall be dead oil of coal tar, commonly known as creosote oil. The remainder to be resin or some other similar and suitable water-proof material. All portions of each individual block shall be thoroughly treated with the mixture, and after treatment the specific gravity of the blocks shall be greater than that of water.

"(3) After treatment the blocks shall show such waterproof qualities that after being dried in an oven at a temperature of 100 degrees for a period of 24 hours, weighed, and then immersed in clear water for a period of 24 hours and weighed, the gain in weight shall not be greater than 3 per cent."

Taking up these specifications in detail, you will see that the first clause refers to the quality of the lumber, a matter which can be determined, as before stated, by careful inspection.

The second clause deals with the nature of the treatment itself. The writer has seen specifications in which at least a page of typewritten matter is devoted to the tests which the creosote oil to be used in treating blocks shall pass. As a matter of fact, it is perfectly well known to all manufacturers of treated timber that the amount of antiseptic material contained in ordinary dead oil of coal tar is sufficient to prevent decay of the wood if diffused throughout its mass, provided the oil is retained in the wood in its full strength and efficiency. In other words, it is useless to specify tests for the creosote oil used if the only result desired is a good specification. In fact, there is such a wide diversity of opinion as to the value of different creosote oils that there is really no settled practice to-day as to the exact analysis of such oils. The state railroads of Germany originally used oils containing a high percentage of naphthaline, the supposed chief function of which is to solidify in the pores of the wood and prevent the evaporation of the tar acids and other antiseptic parts of the compound. Some years ago the practice of the German distillers of coal tar changed, and they began to produce an oil containing very little naphthaline, owing to the sudden extensive use of the latter in the manufacture of artificial indigo. About that time a manufacturer, who treated practically all the ties for the state railroads, gave a dinner to the railway officials and announced, as a result of a series of tests, that oils with very little naphthaline and a very high percentage of tar acids, carbolates, etc., were the most desirable for wood-preserving purposes, whereupon the state specifications were changed, and such has been the practice of the German state railroads since then. This practice prevails because it is that character of oil which the German distilling works principally produce, and for no other reason. The United States Government, on the other hand, has always insisted on high percentages of naphthaline, as is the practice in England, but it has not been found to be the case that the re-

sults with timber treated by the two methods are very different, although the writer believes that where straight creosote is used the naphthaline is a desirable ingredient. The exact action of creosote oil in preserving wood is not understood. All that we know is that commercial creosote oils have been used for many years with almost uniformly good results whatever the character of the oil under analysis. This little digression with reference to creosote oils is intended merely to show the uselessness of specifying any exact analysis for the creosote oil itself. Its analysis will depend very largely upon the particular works from which it comes, some oils running 40 per cent. in naphthaline, some as low as 20 and lower, and others between the two, but all of these oils, as before stated, are sufficiently antiseptic in their nature to prevent decay in wood if they are properly retained in it. For this reason the Brooklyn specification does not provide for any tests for the creosote oil itself, said oil being a staple article of commerce which has been used for timber-treating purposes for over sixty years with uniform success. The strong point of the specification quoted above is its demand for results, and to secure these the manufacturer is required to incorporate with his creosote oil some waterproof material which will perform the double purpose of retaining the creosote oil in the wood and of keeping the water out. As soon as a block begins to absorb water, not only is it in danger of swelling and destroying the surface of the pavement, but by becoming soft and spongy, wears much more rapidly than a block which is waterproof. The very simple expedient is therefore adopted of making an absorption test, the limits of same being 3 per cent. after twenty-four hours' drying and twenty-four hours' soaking in water, a limit smaller than that generally adopted with vitrified brick, and one which means practically no absorption at all. The writer is informed that tests conducted on such blocks in the Borough of Brooklyn last year showed an absorption of less than 1 per cent., these blocks being taken from blocks delivered on the street and being fairly representative of the quality of the shipment.

It should be noted from the specifications quoted above that it is not incumbent upon the manufacturer to use any particular amount of waterproof material in his treatment. The specifications say at least 50 per cent. of the mixture shall be dead oil of coal tar, but the manufacturer might make this 60 per cent., or 70 per cent., or more, but if he does, he will be constantly decreasing the waterproof qualities of his blocks, and getting consequently higher absorptions. Blocks treated with ordinary straight creosote oil alone will absorb from 6 to 12 per cent. of water, and it is a point of excellence of these specifications that they call for results and not methods, it being a perfectly clear and well-known fact that the exclusion of water is the main object, and not how it is done.

Singling out the four important requirements of this specification, which can be determined by inspection or physical tests, we have, first, the quality of the lumber; second, the question of absorption of water; third, the treatment throughout of the block; and, fourth, its specific gravity, roughly determined by the ability of the blocks to sink or float in water. These four physical tests cover almost

all, but not quite, the entire ground. There is one important item in the manufacture of a first-class paving block which is not covered by them, and that is the question of the hardening of the wood. Let us suppose, for instance, that one block is treated with a mixture of creosote oil and resin and shows the required waterproof qualities, depth of penetration, specific gravity, etc. The engineer who has passed such a block knows that the quality of his wood is all right, that the block contains a waterproof and antiseptic mixture which practically prevents the absorption of moisture, and that the block is treated throughout with the preservative material. Experience in the past has shown him that this block will wear well, will not decay, and that the compound with which it is treated does not deteriorate or escape from the wood. On the other hand, let us suppose that a manufacturer were to produce a block treated with a mixture of dead oil of coal tar and some such waterproof material as paraffin or bitumen. It is possible that these blocks would also pass the above specification because the waterproof qualities of a mixture of dead oil and bitumen, let us say, thoroughly forced into the wood, would doubtless be sufficiently great immediately after treatment to repel the introduction of moisture, but considerable difference would exist between the two blocks nevertheless. The first block would be a great deal harder than the original wood because the solidification of the resin in the pores of the wood has been shown by actual tests extending over years to very materially harden the fibers of the wood and increase its resistance to abrasion, and this is a very important requirement in paving block, especially where it is subject to heavy travel. Some other waterproof material, such as that mentioned above, might be used, which, while giving the necessary exclusion of water, would not harden the wood at all, and therefore there would exist between the two blocks a very material difference in their ability to stand heavy traffic. We are therefore brought to the question whether in the case of wood block, as in the case of vitrified brick, some form of abrasion test cannot be utilized which will determine the hardness of the material as well as its resistance to moisture. The ordinary rattler test for brick would be valueless in such a case, if for no other reason because the two faces of the block are the only portions of it which are calculated to stand heavy wear, the four sides being totally deficient in this respect because the fibers of the wood are not presented at right angles to the action of travel. The writer read a paper before the American Society for Testing Materials on this subject at its annual convention at Atlantic City last June, and a series of tests were suggested which might record the amount of pressure required to force a die of a given size into the end fibers of the wood for a constant depth, the block being tightly held in place by suitable clamps, but as yet no results of testing by this

method have been secured. At this convention it was suggested to the writer by Mr. Logan W. Page, Chief, Division of Tests, Bureau of Chemistry, Washington, D. C., that a series of tests might be conducted on paving blocks by means of the Doré machine, now installed in the laboratory for testing road materials at Washington, which machine consists roughly of a horizontal plate revolving against the face of the block to be tested under given pressures, sand being fed upon the plate so as to produce a uniform and regular abrasion of the surface of the test piece. Mr. Page is at present conducting a series of tests upon blocks treated and untreated, and the results of these tests the writer had hoped to present herewith, but a telegram received from Mr. Page, dated September 27, and reading, "Machinery broken down. Cannot send results at present," makes it impossible. For purposes of comparison only, and with no hope of securing results having any absolute, but merely relative values, the writer has had a series of rattler tests made, with the following results:

Six blocks of each kind were tested, the size in each case being $3 \times 3\frac{1}{2} \times 8$. Tests were made upon untreated Georgia pine blocks, block treated with creosote oil and block treated by the creoresinate process. The rattler used was a 36-inch foundry rattler four feet long, and 100 pounds of iron castings were placed inside along with six blocks. The rattler was revolved at about 15 revolutions per minute for two hours in each instance. Results were as follows:

Untreated blocks.

Weight of 6 blocks before testing.....	12 lbs.	2 oz.
" " 6 " after "	11 "	11 "
Loss	4 8/10%	7 oz.

Creosoted blocks.

Weight of 6 blocks before testing.....	16 lbs.	1 oz.
" " 6 " after "	15 "	11 "
Loss	3 1/10%	6 oz.

Creo-resinate blocks.

Weight of 6 blocks before testing.....	17 lbs.	15 oz.
" " 6 " after "	17 "	9 1/4 "
Loss	2 5/10%	5 1/2 oz.

The writer does not believe that these tests have any particular value except as indicating a certain relation between untreated and treated blocks. It would be impossible to recommend the rattler test for paving blocks as a method of testing. The writer hopes that the results upon the Doré machine in Washington will be more conclusive, and that before the society meets again some means will have been arrived at for determining the relative resistance of blocks treated in different ways, not only to moisture, but also their relative resistance to abrasion. Such a determination will, it is believed, ultimately become necessary in any comprehensive system of testing paving blocks.



A MUNICIPAL LABORATORY *

For Testing Asphalt and Cement—The Experience of a Chemist Who Has Had Exceptional Opportunities for His Work in Brooklyn, N. Y.

By W. H. Broadhurst

INQUIRY is frequently made in regard to the proper construction, equipment, cost, and maintenance of a laboratory for testing paving materials, asphalts, cements, etc. Municipal officers, while appreciating the distinct advantages derived by laboratory control of public work, hesitate to establish such a plant without accurate data covering these points. Such data has necessarily been limited. It is therefore the purpose of the writer to describe briefly a plan for a municipal testing laboratory, designed primarily for testing asphalts, asphalt pavements, and hydraulic cements, and incidentally to include facilities for testing any material used on public work. Such a municipal laboratory has been established in Brooklyn, and the details of construction are herewith presented.

NECESSITY FOR ENLARGING LABATORY

Some two years ago the Department of Public Works of Brooklyn decided to enlarge the laboratory, which it had up to that time maintained successfully for about six years, and equip it on a more comprehensive and substantial basis. This change, though much needed previously, was necessitated by the large amount of asphalt paving work planned for the years 1902 and 1903, namely, some 1,300,000 square yards, which was duly contracted for and laid under laboratory control. In planning the construction of the laboratory, we were limited only by the amount of space allotted for this purpose. It was our aim, therefore, to make the details complete in every particular. A corner room 22x40 feet, situated on the top floor of the Municipal Building, and having windows on the east and south sides, was selected as best suited for laboratory purposes. The room was also provided with a large skylight, a very desirable adjunct for scientific work. Plans and specifications were prepared for the installation and erection of the necessary fixtures, cabinets, work-desks, etc., the relative positions of which are shown on the accompanying diagram. Cement testing necessarily creates considerable dust. Dust is inimical to accuracy in chemical analysis, hence these two classes of work should be separated as completely as possible. The room was therefore divided by a plaster partition wall with connecting door, into a cement laboratory and a chemical laboratory.

THE WORK ON CEMENT

The cement laboratory was provided with three briquette immersion tanks, a moist-closet in which to keep briquettes in moist air before placing them in water, a slate-top work-desk running the entire length of one side of the room, and a central work-desk covered with plate glass on which to

mould briquettes. A device for carrying off dust, incident to sieving cement, was also provided for. It consists of a galvanized-iron hood connected to an exhaust draught by a central flue, which will be described later. The briquette immersion tanks above referred to have been especially satisfactory. They consist of three rectangular tanks of 1¼ in. soapstone, 7x2½ ft. x 7 in. deep (outside measurement), having a capacity of 800 briquettes each. The tanks are placed one above the other, 1 ft. 3 in. apart, supported on a wrought-iron framework. They are each supplied with running water, having a supply pipe at one end and an overflow outlet at the other, the flow of water being regulated independently for each tank by a series of Jenkin's globe valves. The equipment includes a Fairbank's cement tester, a Riehle 2,000-lb. cement tester with worm gear, and a general run of cement testing apparatus and accessories. Tests for tensile strength, fineness, time of set, and soundness are carried on from day to day, and more occasionally analyses are made of doubtful samples. Ten thousand briquettes were tested in 1902, and 27,000 briquettes were tested in 1903.

PLAN AND LABORATORY EQUIPMENT

In the chemical laboratory, work-desk cabinets, closets and apparatus cabinets were placed along the entire perimeter of the room. Three slate-top work-desks, 2 ft. 10 in. in width, each provided with a glass-framed hood 7 ft. high, were erected along the south and east walls. The hoods were provided with sliding windows, operated by Pullman spring-balances to economize space, thus avoiding the cumbersome pulley-weights usually used. Each work-desk was provided with a slate backing, carrying water, gas and waste-pipe connections along its entire length. Sinks countersunk in the slate-top were provided at the left end of each work-desk. At the northeast corner of the room a space 7x9x10½ ft. high was partitioned off with glass-frame partitions as a weighing room. This room being small, the temperature may be readily controlled. It is therefore well adapted also for use in making penetration tests on samples of asphaltic cement. In the remainder of the space along the north side of the room three large cabinets were placed. These cabinets are 12 ft. in height and 2 ft. 6 in. in width, divided into upper, middle, and lower compartments, and furnished with ample shelving and drawers for storing apparatus and samples. A sliding ladder attached to a track on the upper part of the cabinets gives convenient access to each. A large work-desk, 10x4 ft., occupies the center of the room.

INTRODUCTION OF NEW FEATURES

With the experience gained in previous years we were prepared to install in the chemical laboratory some necessary, though novel, features. The analysis of asphalts and

* This paper was read by Mr. Broadhurst before the American Society of Municipal Improvements, held at St. Louis, Mo., Oct. 4th, 5th and 6th. The Annual Proceedings of this Society will soon be published. Copies for the current and past years, as well as information about the Society and its work, may be had by addressing the secretary, Mr. George W. Tillson, Municipal Building, Brooklyn, N. Y.—[Editor.]

asphalt pavements requires the use of a considerable amount of bisulphide of carbon, an ill-smelling liquid which evaporates quickly when exposed to the air, forming a gas which is exceedingly injurious to inhale. This gaseous bisulphide of carbon is also very inflammable, and therefore dangerous to have in proximity to gas burners or gas stoves commonly employed for heating purposes in chemical operations. We therefore decided, first, to do away with the flames and employ electric heating devices only, and secondly, to remove the vapor of bisulphide of carbon as soon as generated, by a system of artificial ventilation, i. e., by sucking the air continuously from each hood by means of an exhaust fan connected to a central flue, or more properly, a rectangular sheet-iron duct, cross-section 20x5 in., running beneath the floor under the hooded work-desks, connection being made with each hood by valved off-sets from the main duct. In this way each hood and work-desk is connected with the exhaust, all smoke, fumes, gases and odors generated being quickly removed, and a current of pure air supplied to each hood. The main duct was, of course, installed before the cabinets were erected. It is to be noted that the windows in proximity to the exhaust outlet are kept closed, the intake of air coming through a ventilator in the roof. A No. 4 Sturtevant exhauster with bottom horizontal discharge is used on this system, the discharge passing through a circular opening in the wall. The exhauster is operated by a 1 h.-p. electric motor, direct-connected, and controlled by a speed-regulating rheostat.

ELECTRICAL APPLIANCES

For the electric heating apparatus, four twelve-ampere outlets were provided on a 230-volt current, independent of that used for lighting. The outlets were located at convenient points along the wall at the back of the hooded work-desks, and were connected with plug-switch receptacles which covered them. The electric heating apparatus was furnished by the Simplex Electric Co., of Cambridgeport, Mass. The electric heating devices installed include three immersion coil steam baths, for evaporations, distillations, etc., two flat-surface stoves, one electric oven for obtaining constant and uniform temperatures up to 500° Fahr.

and one controlling rheostat. Each of these instruments provide for three heats, high, medium and low, and the heat may still further be controlled by throwing a rheostat in circuit. The electric oven is particularly well adapted for the determination of the volatile matter in asphalts and oils, as the heat is radiated from iron plates in which the resistance wires are imbedded, thus insuring a uniform heat throughout the oven, a most desirable condition for this class of work. The use of the electric current has the added advantage that the heat may be more readily controlled than by any other method. The chemical laboratory was equipped with an analytical balance, a balance for heavy weighings, a Bowen penetration machine, a Dow penetration machine, and a general run of chemical glassware and apparatus, the operations required in asphalt analysis not differing substantially from those employed in other chemical work, unless it be desired to adopt the centrifugal method of sedimentation, in which case a centrifugal machine will be required.

RELATIVE AND TOTAL COST.

The specifications for the construction of the laboratory required all materials to be of the best quality of their several kinds. All woodwork was of clear white pine. The carpentry work, plumbing and sheet-iron work was let in one contract to the lowest bidder for \$2,745. The total expenses may be itemized as follows:

Carpentry-work, plumbing, and sheet-iron work	\$2,745
Electric wiring, switchboard, etc.....	135
Electric heating apparatus.....	160
Exhauster, motor and rheostat.....	165
Cement testing apparatus.....	600
Chemical apparatus	1,500

Total \$5,305

It is to be understood that a laboratory of similar description may be established and operated for very much less than the above figure; but to equip such a plant with every facility, the above figures are correct. The maintenance for the second year was \$750, and for the current year, we expect this item to be somewhat reduced.

FILTRATION FOR MINNEAPOLIS

THE city council of Minneapolis, Minn., has accepted the report of its special water commissioner, and the people are to vote on the question of issuing bonds. The commission reported upon the most practical method of purifying the city water. The committee recommended the installation of sixteen filter beds, covering thirteen and one-half acres of ground, with a new covered reservoir to hold 20,000,000 gallons of filtered water, also a new feed pipe from thence to Central avenue of sixty inches diameter to properly supply the city without undue friction.

The cost was placed at \$1,270,000, and the annual maintenance charges \$83,500.

Preliminary to the recommendations, the report goes very clearly into the subject of filtration. It shows that the figures made are based upon a 90-gallon per capita supply per day, and the plan of small reservoirs in future throughout the city to take care of the hourly fluctuation of the demand.

They are based upon a daily pump capacity of 40,000,000 gallons a day and a filter capacity of 30,000,000 gallons, planning for plants that could be readily enlarged to 100,000,000.

The chemical filtration is explained in full, and it is shown that such filtration takes out coloring matter better than the sand and takes out disease germs as well. The coloring matter in the Mississippi is only harmful in an æsthetic sense, and is in no wise injurious to health, being in solution and simply a matter of looks. Therefore, the sand scheme is adopted. In using sand filtration, the water can also be softened chemically, if that is desired.

At the present time the Mississippi water is harder than that of the great lakes, but softer than most rivers. Regarding coloring matter, the report states that this is lessening every year as the swamps are drained and logging industries are less in vogue.

VALUE OF MUNICIPAL ASSOCIATIONS*

Experience More Useful Than Theories—Interchange of Practical Ideas Essential—"Boss Rule" Detrimental—Home Rule for Cities Necessary

By J. M. Head

There are, I believe, seven or eight national organizations which have been effected for the purpose of contributing in one way or another to the betterment of municipal conditions. Whether this can best be done by maintaining their separate existence or uniting in one or two organizations may admit of serious differences of opinion, but certain it is that no organization can permanently and materially benefit or improve municipal governments which does not secure for its membership those public officials who for the time being have in charge the actual management and direction of municipal work. In other words, fine spun theories, learned papers, resolutions and petitions of committees are all helpful, but without the active interest and co-operation of those actually in charge, no very great practical results will ever be accomplished.

In fact, those intrusted with authority are apt to regard suggestions and demand from those outside as actuated by some other than purely disinterested motives, and frequently will not give to them that serious consideration to which they are fairly entitled.

That feeling which makes the mother crow believe her young the whitest exists in the hearts of all human beings, and a suggestion which does not, in a measure at least, originate with the party whose duty it is to put it into practical operation will never receive that earnest support which is necessary to make it effective.

When, however, the members of different municipal governments meet in annual convention, and in the course of a week's mingling and interchange of views, and each representative boasting, as they will do more or less, of that which is best in their respective municipal governments, the effect upon officials of other governments will be the very best possible, and each will return to their respective homes determined, if possible, to work out for his city something in the way of good that other officials have done for their cities.

REASONS FOR MUNICIPAL ORGANIZATIONS

It is for these reasons largely that the American League of Municipalities can, and in my judgment is, doing more genuine practical work in the way of improving municipal conditions than it is possible for any other organization to accomplish.

At the same time it must be admitted that the organization lacks something of that stability and fixedness of purpose, owing to the constant change of its membership, which other similar organizations possess. After a patriot has faithfully served his constituents for a number of years, at so much per, and finds all his ideal dreams and disinterested schemes for the public good ruthlessly pushed aside and held up to public ridicule by some other self-sacrificing patriot, the zeal of that ex-official in pure government, re-

trenchment and reform, and the municipal ownership of all public utilities is materially dampened.

His future attendance upon meetings of the League at his own expense, and the preparation of exhaustive papers upon theories that he was denied the privilege of putting into practical operation will become irksome and even a burden which few of us will have the courage to undertake.

This League certainly has within itself the elements of permanency and success so long as a general public interest in the better government of our cities can be kept alive, and the League itself can do as much or more to keep alive that interest as any other known agency.

It has been said that nationally we have the best form of government the ingenuity of man has ever devised, and that we have the worst governed cities in the world. This statement, if true, may be accounted for largely by the fact that at the time our State and Federal governments were organized our population was almost entirely a rural population and even the most enthusiastic boomer of town lots could not have imagined that within one hundred years we would have one city with a population equal to that of the thirteen original colonies at the commencement of the Revolution.

No adequate provision, therefore, was made for the government of our cities, and they were treated as mere incidents or appendages to the State government. In fact, they are now treated as mere creatures of the State, with no rights or powers except such as the States may from time to time confer upon them.

NEED OF HOME RULE IS IMPERATIVE

The idea of local self-government, which is the fundamental idea of all our State governments, was never, until within the last few years, thought of being extended to cities and towns, even in matters of purely local concern.

When you think of it seriously, it seems almost incredible to believe that great cities like New York, Chicago and Boston are not even permitted to select their own police force, and at the same time must raise by taxation and pay that force just such salaries as the legislature of the State may from time to time prescribe. It is difficult to conceive of a more flagrant case of taxation without representation than this, and yet almost every city in the United States is subjected to this iniquity.

It is not difficult then to understand why it is that our cities are the worst governed in the world, since they are governed largely by those who have no part in footing the bills. It is no wonder that valuable and perpetual franchises have been given away for the asking, or paid for to those who had no just right to sell.

These conditions, however, I am glad to say, are rapidly passing away. And just so far as this League and other kindred organizations can succeed in making the people realize that the public has certain rights which even the public service corporations can be made to respect, and just so long

* An address delivered by J. M. Head, former mayor of Nashville, Tenn., at the League of American Municipalities, East St. Louis, Ill., Oct. 4, 1904. Mr. Head retired at this meeting as president of the League.—[Editor.]

as we can keep these questions constantly before the public, just so long may we hope ultimately to secure for cities that full measure of local self-government to which they are so justly entitled.

There is, however, another and possibly a greater danger to successful municipal government from which many cities are suffering at this time, and that is from the withering and blighting curse of "boss rule." Government by legislative committees is bad enough, but is not to be compared to that greatest of all iniquities—the "political boss." He selects and elects the candidate for mayor, he names the county delegation to the legislatures, and picks out all subordinate city officials after he has made up his board of aldermen. He levies assessments on the rich by exempting them from just taxation, collects voluntary (?) contributions from all corporations and contractors who have business relations with the city, looks after the wants of the laborer, dispenses a moderate amount of charity where it will do the most good, contributes to all campaign committees that by any possibility may elect a man to office, and accumulates a large fortune for himself. This, in brief, is the "political boss," who succeeds by standing in with all political parties, acting as go-between for the great corporations who have legislative favors to ask and impecunious public officials who for the time being have the power to give them away. A city that is cursed with a political "boss" has yet much to endure before it can hope to attain to that high position of local self-government to which all cities should aspire.

NO ROOM FOR THE "BOSS" IN CITY GOVERNMENT

The political "boss" has come to be regarded in many cities almost as a fixture and a necessity. In fact, many good people seem to be reaching that condition where they are unwilling to put forth that energy and effort which is necessary to maintain and preserve free government, and so long as the "boss" is moderate in his exactions, fairly respectable in the government which he gives, the average citizen prefers to leave the matter in his hands rather than take the time and trouble to look after the government for himself.

It is the business of this League to destroy the political "boss," to arouse and maintain in the public a lively interest in all questions of city government, to keep constantly before the minds of the people the great advantages to be obtained from local self-government, to educate the public in all mat-

ters pertaining to good city government, and arouse in the minds of all city officials an earnest desire to do something of benefit to the city with which they are connected.

That municipal governments are rapidly improving is perfectly manifest to any one who has given even a moment's thought to the subject.

Notwithstanding the municipal scandals connected with the city governments of St. Louis, Minneapolis, Pittsburg, Philadelphia, and many other smaller cities, the statistics show that for the years 1901 and 1902 the defalcations by bank officials and employees alone, which are supposed to be the best and most carefully managed, and most thoroughly inspected private enterprises known, were more than a million dollars more than from all public officials, federal, State, county and municipal combined. This statement alone should stand as a monument to the fact that the people are capable of selecting their own rulers, that the personnel of public officials is greatly improved, and is far above the average of trusted bank employees, and that sooner or later we may expect to see in fact as well as in theory a city government "of, for and by the people."

ONLY EFFECTIVE REMEDY IN THE PEOPLE'S HANDS

But when all the obstacles to better and purer municipal government are considered, their causes discussed and remedies proposed, we must at last come back to the fundamental proposition that the only real and effective remedy lies with the people themselves in maintaining a continued interest in city government and electing to office none but honest and competent men to discharge the important functions of municipal government. It is difficult to make the general public realize that it is almost as criminal to elect an incompetent man to public office as it is to elect a dishonest one. The incompetent official is used by others just as effectively to accomplish selfish purposes at the city's expense as the dishonest official, who is usually careful not to trespass too far upon the public rights for fear of being detected.

When we can once arouse the general public to a full realization of what it means to elect either dishonest or incompetent men to public office then, and not till then, will the functions of this League and other kindred civic organizations have accomplished their real purpose and a consolidation of all leagues at the ballot box will have rendered further meetings upon our part unnecessary.

MUNICIPAL STEAM HEATING IN DRESDEN

An interesting application of the steam heating system so extensively adopted in this country is in course of experiment in Dresden. In that city the Saxon Government has established a huge central station, and from this the heat is distributed among a number of the municipal buildings, including the Royal Opera House, the Picture Gallery, Zwinger Museum, the Hofkirche, and Royal Palace. The edifices are all situated near the central heating station, which stands upon the banks of the river Elbe, whereby an adequate supply of water is always available. The station contains ten generators, producing over 55,000 pounds of steam per hour. The steam is distributed to the various public buildings by means of steam pipes laid beneath the

streets. But this ingenious heating system is also utilized to fulfil a dual purpose—the generating of electricity for lighting the various edifices. The heat is generated and distributed during the early morning, when the electric supply is not required, and once the buildings are thoroughly heated, it requires but very little pressure to maintain the temperature desired throughout the day. Consequently, this arrangement enables the steam power generated during the later part of the day to drive the electric installation and maintain the pressure required. This combined heating and electric-lighting system has proved highly successful and economical, and its extension to other towns in Saxony is contemplated.—*Scientific American*.

ENGLISH REFUSE DESTRUCTORS *

Methods of Installation Better in English Than in American Cities—Conditions Are Not the Same, but Better Results Could Be Obtained by Emulating English Practice

By M. N. Baker

WE have heard so much in this country about the superiority of municipal administration in Great Britain, as compared with the United States, that I gladly seized an opportunity, during the first half of the present year, to study some phases of municipal affairs in England and Scotland. I found that, as a rule, British cities attempted to do far more for their citizens than do American cities, and that unquestionably many of their affairs are conducted on a far more business-like and efficient basis than are ours. In the various fields of municipal engineering and sanitation the British are superior to the Americans chiefly in pavements, sewage treatment and refuse disposal. In the matter of pavements we are surpassed more in maintenance than in construction; in sewage treatment it is the number rather than the efficiency of the works that gives British sewage works the lead; but in refuse disposal by cremation we are far behind in numbers, in design and in operation.

DIFFERENCE BETWEEN ENGLISH AND AMERICAN DESTRUCTORS

A refuse destructor, as here considered, is the type of furnace which has been perfected in Great Britain for burning municipal refuse. It differs from an American garbage furnace or cremator in that it is designed to burn a different class of material; that it requires no fuel save the refuse itself for combustion; that the heat generated by the burning refuse is utilized for power; and also, in that its selection, design, construction and operation are each and all considered as engineering problems.

In the United States most garbage furnaces, as the very name implies, are built primarily to burn garbage. As garbage is composed largely of water it is no wonder that it cannot be burned without the addition of commercial fuel. Obviously such conditions are not favorable to steam raising. It is also true that, in the United States, a city or town rarely entrusts the selection of a garbage furnace to an engineer or employs an engineer to design or to supervise the design of a garbage furnace. And further, and in some respects most unfortunate of all, when an American garbage furnace is built it is likely to be turned over for operation to men better trained in politics than in burning refractory material. The chances are, also, that when our garbage furnace men attain some proficiency in firing and stoking their furnaces a political upheaval will replace them by men as ignorant as they were at the outset.

ENGLISH METHODS OF INSTALLATION MORE THOROUGH

When a British municipality concludes to install a refuse destructor it usually refers the matter to a standing or special committee of its council for investigation and report. The committee, in turn, calls in the city engineer, and from this

point on to the completion, tests and acceptance of the destructor, the engineer usually plays an important part. In any case, the scheme cannot be carried out until the Local Government Board, a central body with offices in London, has held an inquiry and sanctioned the necessary loan for the work. Such inquiries are held by an engineering inspector of the board. At this hearing any taxpayer has a right to be heard and all questions relating to both the designs and the site of the destructor may be discussed. In rendering its decision on the application for a loan the Local Government Board considers all the sanitary, engineering and economic phases of the subject, and may require modifications of the plans.

Contracts for refuse destructors are awarded after public advertisement, and quite generally include provisions for an efficiency test before acceptance of the destructor. These tests include the quantity of refuse burned in a given time, the temperatures attained in various parts of the destructor and flues, and the quantity of water evaporated by the boilers for each pound of refuse burned.

MANY COMBINATION PLANTS IN ENGLAND

For several years past, most of the destructor installations in Great Britain have been combined with electric light or railway stations, or with works for pumping either sewage or water. In addition, and whether or not power is supplied for the purposes named, one or more boilers are and for many years have been installed for what is termed works purpose. That is, the heat from the destructor is utilized to raise steam to operate fans or steam jets for forced draft or to drive crushers and screens, mortar mills, slab or flag-stone presses, and even brick-making plants for the utilization of the clinker. The various clinker products, either crude or manufactured, are used by the city in the public works or else sold to contractors. Latterly, large quantities of crushed clinkers have been utilized for making sewage filter beds.

To what extent the many and various attempts to utilize the heat generated in the destructors really pays, it is impossible to say. That British engineers and municipalities think the operation profitable there is no doubt. That there is a net profit in the disposal of municipal refuse by the means described few persons who have given the matter careful and discriminating consideration believe. But that the cost of refuse disposal in Great Britain may be reduced by utilizing the heat from refuse destructors there seems to be no question.

It may be well to state some of the reasons which have led to the attempts to utilize refuse destructor heat on a large scale. The early destructors were not wholly satisfactory because their temperatures were not sufficiently high either to burn all the gases generated in the furnaces or to com-

* A paper prepared for the annual convention of the League of American Municipalities, held at East St. Louis, Ill., Oct. 4-6, 1904, by M. N. Baker, Associate Editor *Engineering News*, New York.

pletely burn the refuse itself. To obtain higher temperatures with such a refractory material forced draft was therefore used. It was found that temperatures of 2,000 degrees Fahr. were required for satisfactory cremation. Almost from the beginning of refuse destructors in Great Britain it was believed to be worth while to install boilers to utilize the heat in the gases of combustion before those gases escaped up the chimney. With higher temperatures the utilization of the heat became all the more desirable, and at the same time it became possible to generate high-pressure steam. With the high destructor temperatures and the attempt to generate steam for other than work purposes it was found that the gases leaving the boilers still contained much heat, and, following the general practice in high-grade steam engineering, economizers have, in recent years, been placed between the boilers and the chimneys. These economizers heat the feed water for the boilers.

It appears, from the foregoing review of the main features of refuse destructors in Great Britain, that their development has been carried far beyond that of the American garbage furnace.

To what extent should we try to emulate our British cousins? There can be no question but what we should try to secure as good sanitary results as they attain. At present, some of our furnaces fail to operate without a nuisance, either of odor or dust, and although rarely if ever do these nuisances have any very direct relation to health, yet they are nuisances and as such should be abated.

INTERESTING QUESTIONS TO CONSIDER

Perhaps the most interesting questions for us to consider are whether we also could burn our refuse without the use of supplementary fuel and whether it would be feasible to develop power from our refuse. It may be that if the various classes of our municipal refuse were mixed it would not differ materially from the mixed refuse taken to British refuse destructors. Unfortunately the available figures on this point are scanty. Personally, I doubt whether our mixed refuse has so high an average calorific value as British refuse. I think it probable that the volume of ashes in our Northern cities in winter and of green stuff North and South in the late summer would be a harder test by far than is put on the average refuse destructor in England.

As to utilizing heat from our furnaces the relative cheapness of fuel here makes it less of an object to do so than is the case abroad, and many of our American cities would have no use for the heat after it was developed. This would sound strange in Great Britain, where such a large proportion of cities pump their sewage and operate either electric lights or railways, if not both. But few American cities, fortunately, have to pump sewage; relatively few, compared with Great Britain, own electric-lighting plants, and practically none own electric railways. Moreover, public opinion

is much divided regarding the advisability, under present political conditions, of establishing municipal electric-light plants. A small amount of power might be advantageously used here for works purposes, but in this particular, also, we should have less occasion for power than is the case abroad, since our mixed refuse would produce less clinker to be utilized and since good natural materials for mortar and concrete are, in most sections, relatively plentiful here.

To burn our garbage without fuel would doubtless require mixed rather than separated refuse, but it is by no means certain that enough would be saved thereby to make mixing economical. Ashes free from organic matter are good material for filling and can generally be disposed of for that purpose with only a short haul. But if mixed with garbage the ashes must have a long haul to the outskirts of the city, and after they have been through the furnaces with the garbage a large part of their original bulk must be handled once or perhaps twice more before they reach a final resting place.

WHAT IS MOST NEEDED IN AMERICA

Three years ago, at the convention of this League, held at Jamestown, N. Y., I presented a paper on "The Unsatisfactory Condition of Garbage Disposal in the United States." Chief among those conditions were the failure to consider the whole matter as an engineering question, lack of data on the amount and character of refuse to be handled and short-term contracts. Little improvement in any of those conditions has been made since that time. Meanwhile, refuse disposal in Great Britain has been undergoing marked improvement until it may be said to have been reduced to a science.

What we need in America is to have one, or, far better, a half-dozen, of our cities take up the refuse disposal problem in the business-like way followed in solving problems of water supply and sewage disposal. That would mean the employment of capable engineers to study the subject, including the systematic collection of data showing the nature and amount of the refuse collected. If need be, experiments on a working scale might well be made to determine the type of furnace best suited to American conditions; the relative advisability of mixing and of separating garbage and other refuse; the possibilities of burning our refuse without supplementary fuel and of utilizing the heat for power production; and the economics of garbage reduction, or the recovery of grease and fertilizing material from garbage.

Many of the great cities of America have placed the disposal of their garbage in the hands of garbage-reduction companies, and the tendency has been to pay those companies higher and higher prices for the service. In Great Britain such means of disposal are unknown. Doubtless this difference between American and British conditions is largely responsible for the high development of refuse destructors abroad and their low efficiency at home. Which of our cities will lead the way in solving the problem of economic sanitary refuse disposal in America?



PORTLAND CEMENT*

Its Uses in Engineering Constructions—The Setting and Hardening of Cement (Continued)

By E. Kuichling, C. E.†

IN the preceding number of the MUNICIPAL JOURNAL AND ENGINEER the subject of the setting and hardening of Portland cement was begun by the statement of Le Chatelier's views, and is now followed by an abstract of the somewhat different theory of Michaelis, as set forth in his paper read in August, 1897, before the International Society for the Uniformity of Methods of Testing Materials, as well as in other papers.

THEORY OF W. MICHAELIS

For want of complete proof that the hardening of cement is a purely chemical process, Michaelis adopted the view that it was mainly a physical one depending on surface attraction, as in dyeing and tanning, in which light it was first presented by Cherreal.

It is definitely known that only certain modifications of silica have the property of hardening when mixed with lime and water, and that such silica is generally amorphous. If dried hydrated silica, which contains about one-half molecule of water, is mixed at ordinary temperature with lime paste, the mass will coagulate in a few minutes and then harden; and if more coherent silica, which has been separated from combination by means of acid and then strongly ignited, is mixed with lime paste, a much longer time will be required for the mass to coagulate and harden. Silica in such hydraulic form is largely contained in natural silicates of alumina or "puzzolanas" like trass, pumice stone, Santorin earth, etc., and combines with the hydrated lime to form a calcic hydrosilicate, which is attacked only very slightly by water after hardening.

PUZZOLANAS AND THEIR ACTION

The substance known as "puzzolana" derives its name from Pozzuoli, a town near Naples, where it is found in great quantity. It is the basis of the best Roman hydraulic mortars, both ancient and modern. It is of volcanic origin and is roughly granular, resembling a cinder. In composition it is essentially a silicate of alumina, with some ferric oxide, lime, magnesia and alkalis. It may be made artificially by burning clay, and the natural varieties are often improved by burning, whereby the silicate becomes dehydrated and is left in condition to combine readily with lime. Berthier gives the following analyses of average samples:—

Substance.	SiO ₂	Al ₂ O ₃	CaO	MgO	Fe ₂ O ₃	K	Na	H ₂ O
Puzzolana	44.5	15.0	8.8	4.7	12.0	1.4	4.0	9.2
Trass	57.0	12.0	2.6	1.0	5.0	7.0	1.0	9.6

A similar process of coagulation and hardening takes place with mixtures of lime paste and pulverized dry hydrate of alumina or burned alumina, forming a calcic hydro-aluminate which is considerably attacked and softened by water after it has become hard. On the other hand, if

pulverized hydrated ferric oxide is mixed with lime paste, the mass coagulates and hardens only in slight degree, forming a white crystalline calcic ferrite which is speedily decomposed by water; but if the ferric oxide is calcined or dehydrated, no reaction with the calcium hydrate will take place.

If lime water, kept saturated by suspending therein a piece of lime, is allowed to act upon a mass of hydraulic silica, or gelatinous hydrosilicic acid (SiO₂, 2H₂O), the latter will become covered with a hard and impermeable shell of hydrosilicate of lime exhibiting numerous wart-like projections, while the interior remains soft, as the impervious shell prevents any further combination. The same occurs with pure hydrated alumina, the hard and warty shell here consisting of hydro-aluminate of lime. With anhydrous ferric oxide, no reaction takes place, but with the hydrated oxide the lime will combine very loosely, forming an unstable white crystalline substance as aforesaid.

NATURE OF THE CALCIC COMPOUNDS

The calcic compounds thus formed with the hydrates of silica, alumina and ferric oxide, which contain the largest proportion of lime or represent the highest degree of saturation with lime, are expressed by the formulas: (3CaO, 2SiO₂ + xH₂O), (5CaO, 2Al₂O₃ + yH₂O) and (4CaO, 2Fe₂O₃ + zH₂O). The values of the factors x, y and z have not been determined with certainty, but are assumed by Michaelis at 6, 8 and 7 respectively, the minimum quantity of water being one equivalent to one of lime. Until it has been demonstrated conclusively that the compounds formed during the action of water on calcareous cements are different from those which are formed during the process of setting, it may be assumed that the above-named compounds are actually formed during the setting process, and that any residual lime contained in the cement is liberated as calcium hydrate. In all hardened Portland cement, numerous crystals of such hydrate are found scattered throughout the mass.

According to Le Chatelier, the hydrosilicate of lime formed by the action of water on Portland cement is 2(CaO, SiO₂) + 5H₂O, and the hydro-aluminate is (3CaO, Al₂O₃ + 12H₂O); but as the compound (3CaO, Al₂O₃) swells considerably in combining with water, Michaelis does not regard it as being a predominating constituent of normal cement. He is also unsatisfied with Le Chatelier's account of the hydro-ferrite of lime, and considers that the first-named compound alone has been thoroughly demonstrated. The hydrosilicate of lime is absolutely insoluble in water; it may be decomposed by water, but it is never dissolved, and when it contains an excess of lime, the latter alone goes into solution.

On examining with polarized light the hydrosilicate of lime formed as above described, Michaelis found only an

* Copyright, 1904, by THE MUNICIPAL JOURNAL PUBLISHING CO.

† Engineering Editor, MUNICIPAL JOURNAL AND ENGINEER.

amorphous mass without any trace of crystalline structure, whence he concluded that it is a purely colloidal substance which, if not too rich in lime, resists decomposition by water in remarkable degree. The hydro-aluminate and hydro-ferrite of lime, on the other hand, were clearly seen to be crystalline compounds. These two substances, however, have the property of softening in water like sulphate of lime, although they harden strongly at first; hence they cannot properly be regarded as hydraulic cements. In other respects, the aluminate of lime is preferable to the sulphate, as it is less soluble in water, and can be decomposed by carbonic acid to form insoluble carbonate of lime and insoluble hydrate of alumina, thereby contributing to the permanence of the mortar.

The aluminate and ferrite of lime also combine with the sulphate, as established by Candlot and Michaelis, to form the following compounds: $2(\text{Al}_2\text{O}_3, 3\text{CaO}) + 5(\text{CaO}, \text{SO}_3) + 120\text{H}_2\text{O}$ for the air-dried crystals; $2(\text{Al}_2\text{O}_3, 3\text{CaO}) + 5(\text{CaO}, \text{SO}_3) + 80\text{H}_2\text{O}$ for the crystals dried over sulphuric acid; $(\text{Al}_2\text{O}_3, 3\text{CaO}) + 3(\text{CaO}, \text{SO}_3) + 30\text{H}_2\text{O}$; and $(\text{Fe}_2\text{O}_3, 3\text{CaO}) + 2(\text{CaO}, \text{SO}_3) + x\text{H}_2\text{O}$. The three calcic sulpho-aluminates all crystallize, and each part by weight of aluminate is able to form twelve parts by weight of the double salt. The calcic sulpho-ferrite has not yet been obtained in crystallized form, and can be regarded as being of doubtful character, although it acts similarly as the calcic sulpho-aluminate. In general, the quantity of these double compounds in good cements is small enough to be neglected in considering the main reactions of hydration.

Lime-water enables hydraulic silica, alumina and ferric oxide to take up much water of hydration, and especially is this the case with such silica, which extracts the lime from the water and has often been observed to swell in the process to more than ten times its original volume. The water must, however, be kept fully saturated with lime in order to bring about such a result. On analyzing the compound obtained by thus treating silica which had been burned under the blow-pipe, the following compositions were found:—

Hydrosilicate of Lime.	Percentage of			Constitution.
	SiO_2	CaO	H_2O	
1. Pressed to the consistency of dry starch...	25.62	14.25	60.13	$(5\text{SiO}_2, 3\text{CaO}) + 40\text{H}_2\text{O}$ Polyhydrate
2. Dry substance triturated, washed with absolute alcohol and dried in air at 20° C. containing 60 per cent. of moisture	48.60	27.03	24.37	$(5\text{SiO}_2, 3\text{CaO}) + 8\text{H}_2\text{O}$ Mono-hydrate
3. Same, dried for 5 days over sulphuric acid until constant in H_2O	54.54	30.33	15.13	$(5\text{SiO}_2, 3\text{CaO}) + 5\text{H}_2\text{O}$

It is thus shown that hydro-silicate of lime formed in the manner described may become hydrated in high degree and swell proportionally in bulk. Similarly, the analysis of the compound obtained by treating with lime-water very finely pulverized alumina, which had been heated to redness, yielded:

Hydro-aluminate of Lime.	Percentage of			Constitution.
	Al_2O_3	CaO	H_2O	
1. Pressed to the consistency of dry starch...	25.19	19.66	52.24	$(5\text{Al}_2\text{O}_3, 7\text{CaO}) + 58\text{H}_2\text{O}$ Polyhydrate.
2. Same dried for 5 days over sulphuric acid until constant in H_2O	38.34	29.93	31.73	$(5\text{Al}_2\text{O}_3, 7\text{CaO}) + 23.5\text{H}_2\text{O}$ Two-fold Hydrate.

From these results it will be seen that the dehydrated alumina is changed into a polyhydrate by the action of a saturated solution of lime, and hence also increases in bulk, although less than the silica. Hydrated ferric oxide behaves similarly with the lime-water, but swells much less than the alumina. The explanation for these differences in expansion of original volume is found in the fact that the silica alone swells like a colloid or gelatine, while the alumina and ferric oxide combine with calcium hydrate to form crystalline compounds. Furthermore, water combines with lime in different proportions to form calcium hydrates, the range in ordinary lime paste being from one to eight molecules of water to one molecule of lime. The gelatinous hydrate of lime, which is observed frequently on cement briquettes and pats is a polyhydrate.

THE SETTING PROCESS

The expansion or swelling of the original bulk of the cement by the process of hydration or absorption of water, therefore constitutes a highly important factor in the mechanism of setting and hardening, and explains how a plastic mass of mortar becomes dense and solid. If finely pulverized hydraulic silica, alumina, hydrated ferric oxide and natural puzzolanas are mixed with lime-water, the powder soon coagulates and becomes coherent in consequence of the hydration, even though the dissolved lime has not been fully absorbed. Similarly, if lime paste is mixed with puzzolana, the process of combination will be as follows:—

The hydraulic silica, alumina and ferric oxide take up the water, and produce thereby the initial coagulation or "setting." The silica probably also takes up water from the higher hydrates of lime and, by swelling, penetrates the adjacent plastic lime paste, from which, by the further absorption of water, monohydrate of lime becomes separated. The latter causes the gelatinous or colloidal silica to become stiffer in proportion to the quantity of calcium monohydrate precipitated or separated, and this action Michaelis regards as the true "hardening" process. The silica finally unites with the hydrate of lime in the same manner as animal and vegetable fibres unite with dyes, forming an amorphous substance.

Silica has a great affinity for dyes, the action of which is still obscure and is explained by surface or capillary attraction. By this peculiar action, compounds of fixed chemical proportions are not formed, but quite variable mixtures. Silica, however, cannot take up more than a certain quantity of hydrate of lime. Any excess of such lime in the mixture must remain free; it can be completely enveloped, but it is not chemically combined. This excess mostly crystallizes quickly, especially if only a small quantity of free alkali is present in solution, so that crystals of calcium hydrate become mingled with the amorphous silica, which circumstance may lead the observer to the erroneous conclusion that he has before him a crystallized hydrosilicate of lime.

Another interesting fact is that under high pressure and at a temperature of only 100° C., calcium hydrate seems to cause silica in the form of fine grains of quartz to become chemically active and to enter into combination, thus form-

ing a hydrosilicate of lime. This property has been made the basis of a German patented process for making artificial building stones and sand-lime bricks.

Alumina and ferric oxide behave similarly as silica, but in lesser degree. By thoroughly mixing dry puzzolana powder with a stiff paste consisting of monohydrate and polyhydrates of lime, no more water will be absorbed by these hydrates, as the monohydrate will change to a polyhydrate only at high temperatures. Some of the water is, however, actually absorbed by the mixture, and this absorption can therefore be effected only by the hydration and swelling of the puzzolana, as already pointed out. This swelling of the three hydraulic factors, viz.: the silica, alumina and ferric oxide, especially the first-named, must cause these substances to penetrate into all interstices of the mixture which were previously filled with water, and in this process they tend to envelop the molecules of limes, even if they exert no special force of attraction on the latter. Furthermore, by their combination with water the mixture attains a certain degree of cohesion, which is obviously the greater if the hydraulic factors absorb the water from the gelatinous polyhydrate of lime.

THE HARDENING PROCESS

The setting is thus begun by the hydration and expansion of the hydraulic factors. To secure strong cohesion, however, the presence of a firm material is needed, as the swelling substances become more plastic as they take up more water. Such firm material is afforded by the monohydrate of lime which separates out from the puzzolana, as well as from the lime paste, and by uniting with the hydraulic factors chemically, the solidification of the mixture is accomplished. The interstices of the mass gradually become filled as the swelling, or molecular locomotion progresses, and the mortar becomes dense and impermeable if sufficient cement is present. The swelling continues as long as a solution of lime acts on the hydraulic factors, and as long as any space is left in the mass into which they can penetrate.

In the process of formation the silica hydrate does not exert a great pressure, since it is plastic and can only fill spaces which had previously contained water that was held either mechanically or chemically. Furthermore, these loosely combined polyhydrates of colloidal substances probably liberate some of the water under pressure. On the other hand, monohydrate of lime is a stable substance. Although it occupies less space than its components, yet considerable pressures are developed in the mass in consequence of the increase in volume of the lime molecules by hydration, because the monohydrate is rigid and cannot adjust itself to the interstitial spaces, but grows just where it is formed. It behaves in this respect like crystalline formations, which expand with great force in definite directions.

For these reasons, the cracking or "blowing" of a pat of cement has not been attributed to the swelling of the hydraulic factors, but to the hydration of the lime and the processes of crystallization which take place concurrently with true hydraulic hardening. These processes consist in the formation of crystalline aluminate, ferrite and sulphate of

lime, and the double compound called sulpho-aluminate of lime, previously described.

The solution of the lime alone is not sufficient to produce a thoroughly hard mortar. The lime must be present in excess, preferably as the firm hydrate, and must be mixed as intimately as possible with the puzzolanas or hydraulic factors, otherwise the latter will swell and unite only superficially with the former, thus forming hard and impervious shells containing a plastic interior mass which is prevented from further reaction. The hydraulic hardening process of mixtures of lime and puzzolanas is accordingly analogous to the process of tanning; for just as the prepared soft hide precipitates the tannin and thereby becomes firm and durable, so the swelled hydrated silica unites with the hydrate of lime and forms a hard mineral glue.

SETTING AND HARDENING OF PUZZOLANA MORTARS

Puzzolana mortars usually set slowly, because the quick absorption of water by the aluminate of lime is lacking; furthermore, the energy of the combination of the hydraulic factors with water depends upon their coherence. The relatively slow absorption of water takes place only under the influence of the lime solution and the gradual combination of the hydrates with the excess of hydrate of lime. Puzzolanas must therefore contain free hydraulic silica and alumina, or at least an aluminous silicate capable of swelling in a solution of lime.

True clay, such as kaolin ($\text{Al}_2\text{O}_3, 2\text{SiO}_2 + 2\text{H}_2\text{O}$), is too stable a compound and does not swell when mixed with hydrate of lime; but after the constituents of the clay have been dissociated by moderate burning to the composition ($\text{Al}_2\text{O}_3 + \text{Al}_2\text{O}_3, 3\text{SiO}_2$), or even to ($\text{Al}_2\text{O}_3 + 2\text{SiO}_2$), it hardens hydraulically with lime hydrate. The calcination of clays and natural puzzolanas, however, must not be too high, as otherwise the silica will form stable compounds with the alumina. By the burning process, the ferric oxide alone is excluded from participation in the hydraulic hardening and becomes an inert substance; the silica and alumina are also rendered more coherent, whereby the setting and hardening are retarded.

SETTING AND HARDENING OF PORTLAND CEMENT

The hardening process of hydraulic limes and Portland cements is somewhat more complicated. When these substances are mixed with water, the aluminate of lime sets first, provided that it has not been hydrated previously by the absorption of water from the atmosphere, or by the water of the moist gypsum which may have been added in grinding. The pulverized, anhydrous aluminate, even though it may have been burned to fusion, combines with water immediately, whereby much heat is evolved. Next in order is the hydration of the calcic ferrite and the lime which is either free in the mass initially, or has been dissociated from combination with silica, alumina, etc., by the action of the water. Some of this lime goes into solution, and under its influence the process of the hydration and swelling of the silica and other hydraulic factors then takes place, producing colloidal hydrosilicate of lime.

In forming combinations with lime, the ferric oxide unites with 2, the alumina with 2.5 to 3, and the silica with not more than 1.5 equivalents. Any excess of lime present is free in the mass, although more or less surrounded by the silica hydrate, and it crystallizes mostly as calcium monohydrate. The combination of lime hydrate with ferric oxide is very loose; that with alumina is much stronger, while that with silica is by far the strongest. If the admixture of water is properly proportioned, the hydraulic factors thus take up all of the water left after allowing for the hydration of the lime and calcic sulphate.

The setting of the cement or mortar may therefore be designated as the process of absorbing water, while the hardening is effected, firstly by the union of the hydrate of lime with the silica, due to surface attraction, and secondly by the crystallization of the compounds of lime, alumina and ferric oxide. The hardening process takes place gradually, and depends on the rate at which the calcic compounds which swell and fill the interstices of the mass are formed; hence it appears to be necessary that the lime should be present in excess everywhere during the absorption of water, and that the swelling should be confined within certain limits in order to secure a firm and solid mass.

The reason for having an excess of lime is that the silica, which has completed its hydration only under the influence of a solution of lime, is in too loose a state to harden with lime paste, and forms therewith only a soft cream; but if in the process of hydration the silica meets with solid particles of monohydrate of lime, it consolidates therewith and forms a mass which becomes stronger, in proportion as the mortar has been more thoroughly mixed without much excess of water. On closely observing the hardening of calcareous cements, it is seen very clearly that the process is one of swelling, and that as the hardening advances the density of the mass increases.

ADMIXTURE OF LIME TO CEMENT

In dealing with hydraulic mortars, however, it must be remembered that there is a limit to the quantity of caustic lime, which may be present in the cement, as a considerable excess is detrimental. Such lime absorbs water and carbonic acid, thereby swelling in volume and inducing disruptive pressures. It is therefore eminently desirable to reduce these influences to a minimum by providing sufficient hydraulic silica and alumina to enable the lime, which is free or liberated during the setting process, to combine with these two factors into stable hydro-compounds, as has been stated; and hence it follows that a great mistake will be made by adding lime paste to a binding material like Portland cement, which already contains an excess of lime.

Michaelis demonstrated long ago that such an admixture was justifiable only in the case of poor mortars exposed to the air, in order to increase their plasticity; but with mortars for use in water, the results, although apparently favorable for some time, ultimately become injurious, as the excess of lime dissolves and leaves the mortar more porous, and hence also more susceptible to disintegration. After two or three years such mortars usually exhibit a considerable reduction of strength, notwithstanding that the absorption of carbonic

acid by the lime produces a beneficial effect. The crystals of hydrate of lime have no binding power, and tend rather to destroy the cohesion obtained by the other reactions; but in good cements this tendency is not manifested because the very gradual separation of the lime finds the cohesion too far advanced.

ACTION OF OTHER SUBSTANCES

From his observations, Michaelis found that caustic alkalies, baryta, strontia and manganese oxide prevent silica from swelling while becoming hydrated, also that magnesia hydrate will not harden with any puzzolana. In burned cements the magnesia may be present as an aluminate which hardens when mixed with water, and it can also take part in the hardening process by changing into the insoluble hydrate and carbonate, thereby increasing the density of the mass. Silicate of magnesia formed by burning remains inactive in water. Sulphates of soda and lime in considerable quantity are injurious, the former because of its easy solubility, and the latter because it softens in the course of time when kept under water.

ACTION OF SILICA

Silica is evidently the essential constituent of hydraulic cements, and hence the richer they are in this factor, the better will they be adapted to make the mortar hard and durable when immersed, owing to its gradual increase in density and impermeability. Substances containing much hydraulic silica, like Santorin earth, are excellent additions to weak hydraulic limes and cements, and enable them to resist the chemical action of sea-water in a remarkable degree. On the other hand, their influence is relatively unfavorable when the mortar is exposed to the air, because the hydrates of silica and alumina lose much of their water of hydration at ordinary temperatures as the mortar dries, whereby a shrinkage of volume ensues which produces hair-cracks, and may even lead to complete disintegration.

From this circumstance it follows that hydraulic cement mortars are less durable in air in proportion as they were mixed with a larger quantity of water; and that to make them durable when dry, it is necessary to reduce the swelling of the hydraulic factors as much as possible. This end may be attained, firstly, by using as little water as practicable in the mixing; secondly, by thoroughly ramming or pounding the mass; and thirdly, by selecting the densest or most highly clinkered cement. Conversely, for immersed structures, especially in sea-water, the best protection is gained by chemically fixing the lime and rendering the mortar as impervious as possible. These objects are secured in high degree by enrichment with hydraulic silica capable of swelling strongly, as the lime is thereby held in firm combination and the pores or interstices of the mortar gradually become filled.

It is thus shown that the absorption of water by the hydraulic factors under the influence of lime in solution, and the setting effected thereby, together with the capacity of the hydrates so formed to combine firmly with the lime hydrate, constitute a very plausible explanation of the hardening process of calcareous cements.

(To be continued.)

MUNICIPAL PROBLEMS

**Discussed by Engineers at the International Engineering Congress—Purification of Water
—Disposal of Sewage and City Refuse**

MUNICIPAL PROBLEMS of great interest were discussed at the International Engineering Congress at St. Louis. Three sessions were devoted to three departments of sanitary engineering, viz: Purification of water for domestic use; the disposal of Sewage and the disposal of Municipal refuse.

The subject of Tuesday's session was the Purification of Water, which was opened by a paper of twenty-four pages by Mr. Allen Hazen. One interesting fact brought out by Mr. Hazen was that about 10 per cent. of the urban population of the United States is already supplied with filtered water and filters are under construction which will supply an additional 8 per cent. Mr. Hazen set the average cost of filtration of large municipal water supplies in the United States at about \$10 per million gallons, although extremes may reduce that as low as \$6 to \$8 or increase it from \$5 to \$20. Advances in the method of washing and handling the sand have greatly reduced the cost of operation of filters. In the design of mechanical filters the change from the pressure to the gravity type and the use of large coagulating basins have been among the notable improvements.

Besides Mr. Hazen's paper, M. Bechmann, Chief of the Paris Water Department, contributed a paper on French practice in water purification, from which we gather that general practice in France is extremely backward in this branch of engineering. Filter galleries and various patented processes of water treatment appear to have engaged the attention of French engineers and there are only a few slow sand filters and practically no mechanical filters of the American type in use in France for municipal supplies, although some are in use in industrial plants. A second paper, by Dr. Adolph Kemna, manager of the Antwerp Water Works Company, referred also to the long maintained hostility of French engineers and scientists to water filtration processes and to the recent change of opinion within a period of not more than three years. A fourth paper by J. M. K. Pennik, Director of the Water Supply of Amsterdam, Holland, described the investigations made in selecting sources of ground water supply in the sand dunes along the sea coast from which Amsterdam draws its water.

Among those who took part in the brisk discussion upon this subject, were Messrs. Charles G. Durlach of Philadelphia, J. N. Chester of Pittsburg, Professor Olin H. Landreth of Schenectady, Professor Gardner B. Williams of Ann Arbor, E. B. Weston of Providence, R. I., and W. B. Fuller of New York City.

Mr. Chester said that the mechanical filtration plants of fifteen years ago were capable of working with high bacterial efficiency. The American Water Works & Guarantee Company has two filtration plants at Chattanooga and Little Rock, which have been in service fifteen years, which are showing as good bacterial results as plants just built. The improvements which have been made in mechanical filters

have been chiefly in their construction, to give greater ease and certainty of operation and diminished expense for repairs. Mr. Hazen had referred to the mechanical filter as chiefly adopted to sediment-carrying waters, but in his experience it was often necessary to adopt mechanical filters in smaller places on account of inability to find a suitable location for filter beds or suitable material for their construction.

Mr. Weston said that in selecting a source of supply where filtration was not to be used, much attention should be paid to the appearance of the water. A water may be all right in every other way, but if it is objectionable in appearance, people will reject it and use purchased spring and well water of uncertain and often of objectionable character.

Professor Williams alluded to the fact that a person accustomed to drinking polluted water appears less susceptible to its effects than a person accustomed to pure water. Since people will travel, those living in towns supplied with pure water become more apt to contract disease when they are abroad. Hence, if we purify water at one place we ought eventually to do so at all places. He also pointed out that the benefit of pure water is not measured alone by the reduction in typhoid. He had found that statistics showed when mortality from typhoid was high, mortality from other diseases was high also.

On Wednesday's session the disposal of sewage was the subject discussed, the papers presented being by Messrs. George W. Fuller of New York City and M. Bechmann, Chief Engineer of the Paris water-works and sewers. Mr. Fuller discussed American sewage disposal. He found that of the total urban population of the United States, estimated at about 28,000,000, about 6,500,000 discharges sewage into salt water, about 20,400,000 into inland lakes and rivers, and the sewage of only about 1,100,000 is purified before discharge. There are now about eighty-five sewage purification works in operation in the United States, of which sixty-five have been built in the past ten years. Mr. Fuller fully reviewed the different process of sewage purification and the result of experience with them and his paper, which contained nearly fifty pages, really constitutes an admirable little treatise upon American practice.

Interest was added to the discussion upon this paper by the participation of some of the English members of the Congress who were connected with the Local Government Board of Great Britain. One of these visitors said that in England the choice for sewage disposal usually lies between a contact bed and a percolating filter. Alluding to the large water consumption in the United States and its effect on the sewage disposal problem, he suggested that one reason for the large consumption was the waste through defective plumbing fixtures. In England it is customary to permit the use of only such fixtures as are inspected and officially stamped.

Mr. Rudolph Hering remarked that where a large city like New York polluted oyster beds by its sewage, the oyster beds would have to go, since it was impossible to dispose of the city's sewage otherwise than by direct discharge. At Baltimore, however, where the oyster industry is a much larger interest and where sewage purification is feasible, it might be advisable to adopt it. It is probable that within a year the city of Columbus, O., will have in operation the largest sewage disposal plant in the United States, and it may establish an important precedent with respect to the disposal of the sewage of inland cities remote from large rivers. So far as the scientific basis of sewage treatment is concerned, he did not think the United States was to-day in any respect behind Europe.

Mr. E. B. Weston said it was common to think and speak of exposure to the air as oxidizing sewage. Actually, the only oxidation of sewage is effected through bacterial life, which requires air for its support.

At Thursday's session the refuse disposal of cities was the subject, and was opened by an exhaustive paper of forty-three pages by Mr. Rudolph Hering. We take space for the following summary with which the paper closed:

After years of experience in England, and several careful and thorough examinations and trials made in both England and Germany, the following conclusions have there been reached:

First.—In no European city is the grease sufficient in quantity to warrant the cost of its extraction.

Second.—In England the amount of combustible matter is generally sufficient to burn the refuse and produce steam without the constant addition of fuel.

Third.—In Hamburg the same condition exists; and

Fourth.—In Berlin the refuse contains enough fuel to burn itself during the summer months, but in winter it can only be burned by the addition of coal; sifted Berlin refuse will burn at all times, but not at economical cost. So far as the writer knows, the Berlin refuse disposal question has not yet been finally settled.

The most important questions for solution in the United States now are:

First.—The extent to which reduction works are satisfactory and economical. In the largest of our American cities the amount of wasted fats and oils has been sufficient to pay for extraction. The question yet before us is the limit down to which it will pay, and the lowest profitable price for the grease.

The extraction of grease is but a part of the refuse disposal. There are also other parts, and the further question remains as to the total economy of properly disposing in addition all these other parts.

Second.—The question as to the most effective and economical crematory in order to burn all or some parts of the refuse. In Europe there are several of such refuse destructors which for efficiency and economy have stood the test of years. It is true that they may be less efficient for American refuse. The adoption of the English furnace in Montreal and San Francisco has not met with the same per-

fect success which is recorded in Europe. Yet the history of American types of furnaces has not been any more encouraging, and in a number of instances even less so. The question of comparative cost, on the basis of both wages and combustibility of material, in Europe and America, also indicates that America has room for improvement in the methods of refuse cremation.

Third.—Present English practice indicates that the utilization of heat from refuse destruction promises to reduce its cost and make the works more efficient. To utilize economically the power in the United States would require the addition of auxiliary grates upon which to burn coal for steaming when the efficiency of the refuse for this purpose falls short. The question arises as to how far this is economically practicable.

Fourth.—The question as to how far the refuse shall be separated and collected in different receptacles, depends on the adopted method of final disposal. The fact that even a large city can change from a combined to a separate system of collection without serious trouble, which is a more difficult change than the reverse, was demonstrated a few years ago by the city of New York. Dependent further on what is to be done with the different parts of the refuse, is the decision as to which parts, if any, can be combined, which decision again determines for each the best intervals of collection.

Fifth.—A decision regarding the most economical final disposal must also depend upon a more accurate knowledge than yet exists of the character, analysis, relative quantities and seasonal variations of the materials making up the refuse.

With the above questions satisfactorily answered, the writer believes that the art of collecting and finally disposing of the municipal refuse of American cities will be materially improved.

In the discussion, Professor O. H. Landreth said that classification of city wastes before collection was essential, in this country at least, to any successful disposal. In all American cities where wastes are collected, from one to four classes of wastes are made. The most common plan is to make three classes, viz.: garbage proper, commonly called swill; combustible material, such as paper, rags, and wood; refuse and ashes and incombustible material, such as old metal, glass and tin cans. Experience shows that in this country wastes can be handled more economically with separation than without. As respects the cremation of garbage proper, the material contains about 80 per cent. water, 10 per cent. ash and 10 per cent. combustible material. Excluding the ash, if the stuff were to burn itself, one pound of combustible would have to evaporate about eight pounds of water, which would be a pretty good record for a steam boiler where the fire is all in the furnace and the water is separated from it and every condition is favorable to combustion. In a garbage furnace no such advantageous conditions are present, and if American garbage is to be successfully cremated, fuel must be added in most cases at least.

Regarding the disposal of combustible wastes, it is noteworthy that Buffalo has recently let a contract for a furnace to burn combustible refuse to raise steam to run a sewage pumping station.



Published Monthly by
THE MUNICIPAL JOURNAL PUBLISHING COMPANY
253 Broadway, New York

WILLIAM S. CRANDALL, - - - - - MANAGING EDITOR
EMIL KUICHLING, C. E., - - - - - ENGINEERING EDITOR

JOHN B. BENNETT, - - - - - BUSINESS MANAGER
JAMES H. VAN BUREN, NEW YORK, - - - EASTERN REPRESENTATIVE
J. M. SCHLOENBACH, CHICAGO, - - - WESTERN REPRESENTATIVE

TERMS OF SUBSCRIPTION
(Payable in Advance)

United States and Canada	\$3.00 per year
Foreign Countries	3.00 "
Single Copies, each	.25

Special rates given for clubs of ten or more.

Make all checks payable to The Municipal Journal Publishing Company
Entered at the New York Post Office as second-class matter

NEW YORK, NOVEMBER, 1904

The Automobile Peril

AN average of a life a day is the startling tribute that New York is paying toward the development of the automobile and the pleasure of its votaries. Automobile races held on Staten Island some time ago brought about an appalling catastrophe. The same was true of the recent cup races held on Long Island.

A strong public sentiment is being aroused in England against what is called the motor-car peril. Every day the newspapers print letters describing accidents and calling attention in emphatic terms to the encroachment upon the rights of the public by motor car and motor cycle owners and drivers. Some days these letters occupy a column or more of space, and their tone indicates that a profound feeling of indignation exists among the writers.

A circular has recently been issued voicing this public sentiment and calling for the formation of a highways protection league to preserve the rights of the public. The circular says that daily experience shows that the facilities afforded to the public for putting a stop to reckless driving on the highways, for punishing persons guilty of such conduct, and for obtaining redress in cases of injury are wholly inadequate. No general register of cars is kept, but the council of every county and of every county borough keeps a local register. Even this local register is not open to the public, and a person can obtain a copy of the entries relating to any specified car only on payment of 1 shilling (24 cents), and then only in case he can show that he has a reasonable cause for requiring it.

Many of the public roads, the circular continues, can no longer be used by pedestrians, especially by old persons or children, by riders and drivers of horses, or by bicyclists,

without incurring serious risk from the drivers of motor cars and motor cycles, to say nothing of the concomitant evils—dust, noise and smell. And it is asked: "Are the general public content to be driven off the highways without remonstrance for the benefit of a comparatively small number of persons who ignore their rights?"

That there is some justification for complaint is proved by the long lists of accidents to pedestrians from motor cars recorded in the newspapers. A remonstrance on behalf of animals has also been raised. In a recent letter to the president of the Automobile Club, Mr. F. E. Pirkis, chairman of the National Canine Defense League, enters on behalf of his committee a strong protest against the "terrible slaughter" of dogs in country districts by automobilists. While admitting that in a small percentage of cases the dog may have rushed upon his death, he continues: "Again and again cases have been brought to my knowledge in which a dog's life has been ruthlessly sacrificed rather than that a 'good run' should be spoiled. A rather well-known automobilist, to my certain knowledge, is in the habit of boasting that he had killed over fifty dogs during a recent tour, and another (a lady motorist, I regret to say) has been heard to exclaim: 'That is nothing—we run over a dog every time we go out.'"

The result of this agitation of the subject is a proposition from some members of the Roads Improvement Association to repair and adapt the old Roman roads to the requirements of motor car and cycle traffic.

The scheme to repair and bring these old Roman roads into use again for the accommodation of cycles and motor cars is an ambitious one, and if carried out will need national assistance through Parliament. There is one aspect of the question which may give the government popularity. It is pointed out by a military authority as follows:

In the event of an invasion of England there is no doubt that motor wagons will be very much used, and in that case direct roads like these old Roman ways would obviously be an immense advantage if they were in proper condition for motor traffic.

A recent report issued by the home office shows that up to April 1 this year there had been registered in England and Wales 14,771 motor cycles, and 13,302 motor cars of all other kinds; a total of 28,073. In Scotland there were registered 866 motor cycles and 1,037 other motor cars. The total number of licensed drivers in England and Wales was 36,460, and in Scotland 2,606. Of these, 4,478 in England and Wales and 332 in Scotland were licensed to drive motor cycles only.

The increase in population and in the number of automobiles will soon make the motor car peril as pressing in America as it has already become in England. It may be interesting, then, to know how England proposes to deal with the question.

Lessons from the Fire Congress

THE discussions that occurred and the conclusions reached at the recent International Fire Service Congress, held at Budapest, carry with them valuable lessons to students of the subject in this country inasmuch as they lead to a com-

parison between our methods and those of Europe, whereby we may be led to realize our deficiencies as well as to discover wherein we excel.

This conference was on less comprehensive lines than that held in London in 1903, and was limited in the main to the fire service and its kindred societies, and did not extend to the municipal official, and the surveyor, the engineer, and the architect in private practice. But as a fire service congress it was well attended and well managed, and the resolutions passed will be generally approved. Great Britain was well represented. A special commission had been formed by the British Fire Prevention Committee, and comprised executive officers of that body and of the National Fire Brigades Union, who not only went to attend the Budapest meeting, but to learn as much as they could in the larger cities passed through en route, such as Munich, Frankfort, Cologne and Vienna. We understand that the result of the commission's visit is to be embodied in the report of the British Fire Prevention Committee, and it should prove valuable reading.

Regarding mills and factories, the Congress considers:— (1) "That mills and factories should be provided with properly organized private fire brigades to meet the early stages of an emergency, and that these brigades should be officially inspected at regular intervals"; or (2) "That any fire or alarm of fire in a mill or factory, however slight, should be immediately reported to the local authority, with the view of preventing similar occurrences, and that a failure to immediately make such a report should be heavily penalized." (3) "That the preventive measures against the possible outbreak of fire in mills and factories should be increased by a more systematic development of the structural regulations defining watchmen's duties and responsibilities."

There is nothing in these resolutions that does not apply with equal reason in this country. In fact, they apply more particularly to us, for we are notoriously less careful than Europe in the matter of precaution.

With regard to theaters, the Congress considers:—"That it is absolutely essential that all stage scenery and properties be rendered non-inflammable in a reliable and permanent manner, and that all the constructional parts of a stage be of a fire-resisting character."

This is an admirable resolution and one that cannot be too often reiterated in this country. It is less than a year since the appalling disaster at the Iroquois Theater in Chicago, and yet the horrible lesson is already disregarded if not forgotten. It is a common thing for many of the theaters of New York to-day to utterly ignore and disregard all of the reasonable precautions against the recurrence of a horror like that of Chicago. This is plain speaking, but it is true. Within a week the aisles and passages of one of the leading playhouses were observed to be choked and congested with spectators to the imminent danger of every soul in the building. Greed in its worst form is responsible for a condition, that if not checked, will grow to be intolerable.

On the question of the chemistry of fire protection the Congress gives us a hint that we cannot afford to ignore when it says that "the greatest attention should be accorded to the chemistry of fire protection, in the interests of fire prevention." Too little attention is paid to the chemistry

of fire with us, and in this regard Europe is far more progressive.

Finally when we come to the subject of fire alarms and fire signals, all other countries can take lessons from us, for we undoubtedly possess the finest system in the world. The Budapest Congress suggests that "the public authorities should accord greater attention to the installation of modern fire alarm systems in the minor urban and rural districts." In carrying out this wise suggestion, the communities referred to can learn valuable lessons in the United States.

The Ethics of Pallas

PARK COMMISSIONER PALLAS, of New York City, has, among other things, jurisdiction over Bryant Park, in which the new public library is being erected. Against the protest of every citizen having the least pretensions to good taste and municipal pride he has, for gain, defaced the fence surrounding the new building with promiscuous advertising. It has long been evident to the citizens of New York of all shades of political opinion that Mr. Pallas is the wrong man in the wrong place. Doubtless, Mayor McClellan would receive his resignation with equanimity, while he may hesitate to ask for it.

Concerning Mr. Pallas' most flagrant disregard of ethics, the *New York World* says:

"The Municipal Art Society is about to bring a taxpayers' suit to enjoin the preposterous Pallas from blazoning upon the Public Library fence the merits of his favorite brands of corsets, underwear, whiskey and patent medicines. The medical part of this advertising appears to be clearly illegal, and the rest is such a flagrant outrage upon public decency that a court may well be expected to grant relief.

"Since Pallas got himself into his present scrape Mayor McClellan can have no excuse for helping him out of it. It was bad enough to let him stay in office after he had so conspicuously proved his unfitness, but at any rate the city's Law Department ought to give him no help in defending his scandalous sacrifice of the city's interests."

From all of which it would appear that Pallas is a paradox, as he is apparently devoid of wisdom.

Meeting of League at East St. Louis

THE eighth annual meeting of the League of American Municipalities was held at East St. Louis, Ill., Oct. 4th, 5th and 6th. The attendance was smaller than that at Baltimore last year. But that was to be expected, inasmuch as the place of meeting was so near to the great attraction of the year, the World's Fair.

An interesting program was carried out in a perfunctory way without discussion of any importance. The papers read were up to the average, but none of them, with the exception of the president's retiring address, struck the keynote as did that of former Mayor Head, of Nashville, at the Baltimore meeting last year.

The most important action of the League consisted in the adoption of a set of resolutions to pay the secretary a salary of \$2,400 a year if it could.

Toledo, after a sharp contest with Columbus, was se-

lected as the place for meeting next year. The officers elected for the ensuing year are as follows:

William C. Crolus, mayor of Joliet, Ill., president; G. R. Rhett, mayor of Charleston, S. C., first vice-president; Alderman George Stewart Brown, Baltimore, Md., second vice-president; Alderman Joseph E. McCafferty, Wilmington, Del., third vice-president; W. D. Morgan, mayor of Georgetown, S. C., treasurer; John MacVicar, former mayor of Des Moines, Ia., secretary.

The following trustees were elected: William Baker, mayor of Lockport, N. Y.; W. W. Drennen, mayor of Birmingham, Ala.; Silas Cook, mayor of East St. Louis, Ill.; President Bohl, of the Board of Public Service, Columbus, Ohio.

The Greatest of Subways

WITH the arrival of November, the greatest of subways, which underlies New York, has come into complete operation as a rapid transit railway, and a relief from the dangerous and disagreeable congestion that has long been a feature of surface travel.

Time alone can develop the faults in the system which has been made as perfect as the conditions of the hour will allow. The subway was constructed under the very best auspices; there was plenty of money, plenty of time, and the engineering skill of the whole world to draw upon.

The result so far as can be judged at the present writing, is entirely satisfactory. First of all the completed system is safe; secondly, it is scientific, and lastly, it is artistic. There is no device, from non-combustible cars to the newest circuit breaker, which is not in this subway. Its officers, one and all, declare that they cannot see how a serious accident is possible.

The present subway, extensive and ambitious as it is, marks but the beginning of a system of a subterranean city that will be more far-reaching in its ramifications than anything of the kind ever before attempted by man. The peculiar topography of the city forces its citizens to burrow into the bowels of the earth as well as to build viaducts above the surface of their streets. The underground system, so far as completed, is gratifying in that it shows that the city has at last awakened to the necessity of beauty in its public works—for the subway is probably as graceful and artistic as such a work could be made.

The present is not the time to express regret regarding the absurd terms on which the city parted with this valuable franchise. The opening of the tunnel marks the beginning of a new era, and the city is to be congratulated on the possession of the handsomest, brightest and most completely equipped underground railway in the world.

Editorial Comment

A MEETING of a number of persons interested in cement and cement construction was held in St. Louis during the Engineering Congress, at which reports were made of the results of a canvass of the question of the formation of an association composed of users of cement. As a result, it was decided at the meeting referred to, to issue a call for the convention of users of cement at Indianapolis, January 17-

18-19, 1905. Arrangements were made for securing competent persons to speak upon the various subjects which will come up for discussion, and to arrange for the local entertainment of the convention, so that it may be successful in all its details.

The St. Louis *Republic* points out the fact that in the past of American cities there has been the mistake of regarding integrity as a personal quality and not an attribute of a public corporation. Principle has been sacrificed and public business demoralized.

The radical remedies which succeed reform victory show that the individual official, like a private individual, must face the penalty of a bad conception of right and wrong.

Franchise-seekers have paid more than equitable prices for privileges which they have secured; they have been compelled to bear penalties. Citizens who have evaded the law have ascertained that there is not even material profit. Officials and bribe-takers have seen that the game is not worth the sacrifice.

The lesson of experience plainly is that the relation of all special interests to the municipal interests is so close as to make the standard of good government the safe rule for the community.

Experience has demonstrated this homely truth of moral safety. There is no advantage in having dishonest or incapable men in office; or in subverting principle for gain.

It is fashionable to pretend to believe that there is more corruption or "graft" in political or municipal life than in the business world, but the facts do not bear out any such assumption. When business men can be brought to discuss the methods that are quite common in the commercial and manufacturing world the result would cause an ordinary municipal servant to open his eyes in astonishment that such corruption could be allowed to exist. A recent writer in *The Independent* has laid bare some of the secrets of corruption in business, which is more flagrant than any present hint of municipal corruption of which we are aware. Municipal officers are fiercely censured when caught in irregularities, but they are rarely praised for honest and efficient exercise of their duties.

A Chance for Investors

LONGVIEW, TEXAS, Oct. 8, 1904.

Editor, MUNICIPAL JOURNAL AND ENGINEER:

The citizens of this city are endeavoring to get up a company for the purpose of putting in a system of water works and sewerage, and have, up to date, subscribed \$15,000. Now, our object is to get some outside capital to come in and carry the movement forward. Besides the taking of stock by our citizens, the city will do everything that is possible to give any company assistance, and will grant almost any reasonable request, such as a franchise, and agreeing to take a goodly number of fire plugs.

Longview is a city of about 5,500 people; assessed valuation about \$1,500,000; three railroads, Texas & Pacific, International & Great Northern, and the Texas, Sabine Valley & Northwestern, the last-named railroad having its shops

located here. We have a large plow factory, a box factory, employing 500 people, three lumber mills, pottery works, foundry works, two oil mills, ice factory, electric-light plant, street cars, and sugar mill—besides there is marketed here annually about 15,000 bales of cotton. We are very anxious to get some good people from the East to come in with us, and I wish that you would please publish this letter.

G. A. BODENHEIM, Mayor.

Personalities

—Mayor McKenzie, of East Rutherford, N. J., is back at his desk after an extended trip abroad.

—Mr. Fred W. Witter has been appointed superintendent of water works of Newark Valley, N. J.

—F. B. Sliger has resigned as Mayor of Helena, Ark., on account of the increase of his business affairs.

—Mr. Clifford N. Miller has been appointed assistant engineer of the Water Works Commission of Cincinnati, O.

—Mr. John B. Duncklee has been engaged by the village board of South Orange, N. J., to take charge of local municipal improvements.

—Mayor J. H. Waring, of Olean, N. Y., delivered the address of welcome to the visitors to Olean during the recent centennial celebration.

—Mayor George W. Moore, of Webb City, Mo., delivered an address of welcome to the delegates to the Good Roads Convention on October 17.

—Mr. Edward S. Cole, of New York, the pitometer expert, is investigating the alleged serious leaking of water in the water mains of Norfolk, Va.

—Mayor Smith, of St. Paul, Minn., has taken under advisement the report of the Charter Commission on the question of amendments to the city charter.

—Mayor Dr. H. S. Billmeyer, of Bellevue, O., who was recently charged with attempted boodling in the council, is said to have left for California on business.

—Marquis F. King, a former Mayor of Portland, Me., and president of the Maine Genealogical Society, died in Portland October 21. He was sixty-nine years old.

—Former Health Commissioner Lederle, of New York, was in Berlin in September making a study of German methods of street cleaning, the disposal of sewage and other municipal works.

—The grand jury of Huntsville, Ala., on September 15, returned indictments against Mayor T. Smith of that city and Sheriff A. D. Rogers. They were charged with dereliction of duty in not suppressing the mob at a recent lynching.

—Mayor Rose, of Milwaukee, recently visited Tucson, Ariz., in the interests of the Twin Buttes copper mine. A resolution was introduced by Alderman Seidel to cut the mayor's salary for the time he was away from the city. It was referred to the finance committee.

—At Corinth, Miss., recently a warm municipal election was held between Democrats, 480 votes being cast. T. E. Henry was elected mayor by 141 majority. The closest contest was for city clerk, Henry Sharp winning by a few votes. H. P. Rowell was elected marshal; W. B. Wilson, tax collector, and E. P. McCullar, treasurer.

—With a view to inspecting the municipal improvements of the city of Duluth, with special reference to the pavements, a party of six of the city officials of Hancock, Mich., paid a visit to that city on September 27. The party consisted of Mayor Thomas Coughlin, Aldermen Charles Lewis, Frank Congdon, John Stehlin and Erick Anderson, and Chief of Police Edward Lee.

—Arthur Townsley, a student in the University of South Dakota engineering department, at Vermillion, S. D., has been appointed city engineer of Vermillion by Mayor Ferry. Townsley is but 19 years of age, yet he had little difficulty with the rigid examination which he was required to take before accepting the appointment. He is said to be the youngest city engineer in the United States.

—Notice of the resignation of Mr. Nicholas S. Hill, Jr., as Chief Engineer of the Department of Water Supply of New York City has just become public. Mr. Hill resigned to take effect August 1, but at the request of Commissioner Oakley remained in office until September 1. Mr. George W. Birdsall, consulting engineer of the department, has been Acting Chief Engineer since Mr. Hill's resignation.

—F. M. Chapman, former Mayor of Louisiana, Mo., died recently of heart trouble. He was born in Zanesville, O., 46 years ago, but had lived at Louisiana for a number of years. For ten years he was a member of the City Council, from which he resigned last spring in order to become Mayor. A short time before his death he was forced to retire from public life on account of his health. He had many friends and his death was keenly felt.

—While assisting Marshal Smith in the capture of two bandits, on September 17, Mayor W. S. Bennett, of Thompson, Ill., lost his life. There had been a great many robberies in the neighborhood, and as two suspicious-looking men were observed hanging around the streets, Chief Smith decided to arrest them with the Mayor's assistance. When the Mayor was guarding one, while the chief was capturing the other, the first bandit pulled a revolver and shot the Mayor several times, killing him instantly.

—On September 29 Alderman John Pound, chairman of the London General Omnibus Company, limited, was chosen lord mayor of London for the ensuing year. He was born in Leadenhall street, city, in 1829. Alderman Pound will succeed Sir James Thomson Ritchie as lord mayor. Mr. Pound is head of the firm of John Pound & Co., and was elected alderman of Aldgate ward in 1892. He is past master of the Leather Sellers' Company, past master of the Fan-makers' Company and past master of the Fruiterers Company.

—Mayor D. A. Yeiser, of Paducah, Ky., has refused to discharge the Chief of Police or any of the police officers for failing to break up the Sunday theatrical performances. He is also out in a hot card to Evangelist Holcombe, charging that the church people made up several hundred dollars Sunday night for an itinerant preacher and then abused the officials of the town, instead of worshiping God, and charges that the people "came asking for bread and ye gave them a stone." A great deal of feeling has been stirred up over the affair.

—The Republicans of Westchester County, N. Y., have nominated Mayor John E. Andrus, of Yonkers, for Congressman in the Nineteenth district, which takes in the whole of Westchester. Mr. Andrus is considered the richest Congressional candidate in the United States, because he is worth more than \$30,000,000. He has a big mansion on Hudson Terrace, overlooking the Hudson River, and he gives away more than \$250,000 to charity every year. He is a founder of several institutions, including Syracuse University. Every Christmas eve he sends out 1,200 dinners and presents for children throughout the poor sections of Yonkers.

Convention Dates

December

—American Society of Mechanical Engineers will hold their annual meeting at New York City on December 6. Secreary, F. R. Hutton, 12 W. 31st street, New York City.

January

—The American Public Health Association will meet at Havana, Cuba, January 2-6, 1905. Dr. Charles A. Probst, Secretary, Columbus, O.

February.

—National Brick-Makers' Association will meet for its nineteenth annual convention at Birmingham, Ala., February 6-11. T. S. Randall, Secretary, Indianapolis, Ind.

March

—The International Society of States and Municipal Building Commissioners and Inspectors will meet at Washington, D. C., March 2-4, 1905. F. W. Fitzpatrick, Secretary, 1431 Welling place, Washington, D. C.

October

—American Society of Municipal Improvements will meet at Montreal, Can., some time in 1905. George W. Tillson, Secretary, Municipal Building, Brooklyn, N. Y.

—The League of American Municipalities will meet at Toledo, O., next year. Hon. John Mac Vicar, Secretary, Des Moines, Ia.

The Paving Problem in Atlanta

A SPECIAL committee appointed by the Mayor and Council of Atlanta, Ga., recently visited the principal northern cities to study the problem of paving. After investigation the committee concluded that no ideal pavement had been found and that the paving of Atlanta's streets compared favorably with that of other cities. The following is a summary of the report of the committee after visiting New York, Brooklyn, Boston, Cambridge, Lynn, Springfield, Baltimore and Washington:

"We find that in all the cities mentioned that the street-paving problem is agitating the minds of those who have it in charge, and it is generally agreed that the ideal pavement has not yet been discovered.

"With the exception of asphalt blocks, creosoted wood block and bituminous macadam, we find nothing different from what we have here, and it is with pleasure that the committee can say that the streets of Atlanta compare very favorably with any found in our tour of inspection. The same trouble along the car tracks that has been so destructive to our asphalt streets exists in all these cities, and

this seems to be true where the tracks have been laid on concrete stringers. In all cities except Washington, with some few exceptions, where a monolithic pavement is laid, the car tracks are paved with granite blocks. In Washington the entire street is paved, using two courses of paving blocks on the outside of the rails and one course on the inside of the rails. In some cases the gutters for a width of 20 inches are also paved with vitrified blocks.

"We examined in New York, Boston, Springfield and Baltimore some short blocks and bridges paved with creosoted blocks, and were favorably impressed, and consider it a first-class, durable and permanent pavement, and on such streets as the grade would permit its use are satisfied that it would prove very acceptable. The engineers in the East do not recommend the use of creosoted blocks on grades exceeding $2\frac{1}{2}$ or 3 per cent., owing to its slipperiness in damp weather. We find that it is the most expensive in first cost of any pavement we examined, costing \$3 to \$3.50 per square yard. As we are in the midst of the lumber market, it could no doubt be laid cheaper here. We also visited Perth Amboy, N. J., and inspected the plant for the treatment of creosoted blocks, and are satisfied that this treatment is such as to render them both durable and sanitary.

"We visited Lynn, Mass., and witnessed the construction of a street in that city that was being laid with Warren Brothers' bitulithic pavement, and were greatly pleased with the appearance of the street. We are unanimous in the opinion that this mode of construction will make a first-class, smooth pavement, and one that can be used on much steeper grades with more satisfaction than any class of smooth pavement that we examined. As to the durability we are not entirely satisfied, as this class of pavement has only been in use some two or three years and its durability over the regular macadam depends upon the bitumen used in its construction. If the bitumen should evaporate we would have left only the macadam pavement. The Warren Brothers claim that they have solved this problem and that the material they use is not any longer volatile and will remain intact perpetually. This, however, can only be determined by time.

"The recognized requirements for an ideal pavement are as follows:

"First, low first cost; second, low cost of maintenance; third, ease of traction; fourth, good foothold; fifth, ease of cleaning; sixth, noiselessness; seventh, healthfulness; eighth, freedom from dust and mud; ninth, comfortable to use; tenth, non-absorbent of heat.

"While these are the requirements, it is conceded by all engineers that there is no pavement that will fill all the conditions, and the question resolves itself into a matter of judgment that must be determined by the local conditions as to the cost of materials, grades, width of streets and character and amount of traffic.

"In concluding this report we would recommend that small granite blocks approximating four inches in width, eight inches in length and six inches in depth laid on concrete foundation be used on streets of very heavy traffic, around freight depots and warehouses and on grades that are too steep to use a smooth pavement.

"On retail business streets and around office and public,

buildings and high-class residence streets with a large amount of traffic, either creosoted wooden blocks, asphalt blocks or sheet asphalt may be desirably used, but where sheet asphalt or bituminous macadam is used we would suggest that between the street railroad tracks and for not less than nine inches outside of the tracks be laid with either asphalt blocks or vitrified paving blocks or creosoted wooden blocks where the grade will permit, and on asphalt streets that the gutters for a width of 20 inches be laid with vitrified paving blocks.

"Brick pavements may be used to advantage on second grade retail business streets, narrow streets with car tracks and residence streets of light traffic.

"The bituminous macadam is desirable where a smooth pavement is wanted and the grades are such as to prevent the use of either asphalt or creosoted blocks.

"For suburban streets with light traffic, driveways in parks, etc., we would recommend the use of macadam and chert, using if possible trap rock for the wearing surface."

To Abate the Smoke Nuisance in Detroit

AN ordinance to prevent the smoke nuisance in Detroit, Mich., provides as follows:

"Section 1. The emission from any chimney or smokestack within the city, of dense smoke, or smoke containing soot or other substance in sufficient quantity to permit the deposit of such soot or other substance on any surface within the corporate limits of the city, or in such quantities as to in any way injure the health or property of any person, or of such a nature or in such quantity as to be dangerous or offensive or unwholesome, or cause annoyance to any of the people of the city of Detroit, shall be deemed and is hereby declared a public nuisance.

"Sec. 2. There shall be an officer of Detroit known and designated as "Smoke Inspector," who shall be a citizen of Detroit, with the powers and duties hereinafter described: To be appointed by the Board of Health of the city of Detroit, whose term of office shall end on the 30th day of June, succeeding such appointment, unless otherwise provided by the Board of Health; and the salary of such officer shall be fixed by the Board of Health of the city of Detroit.

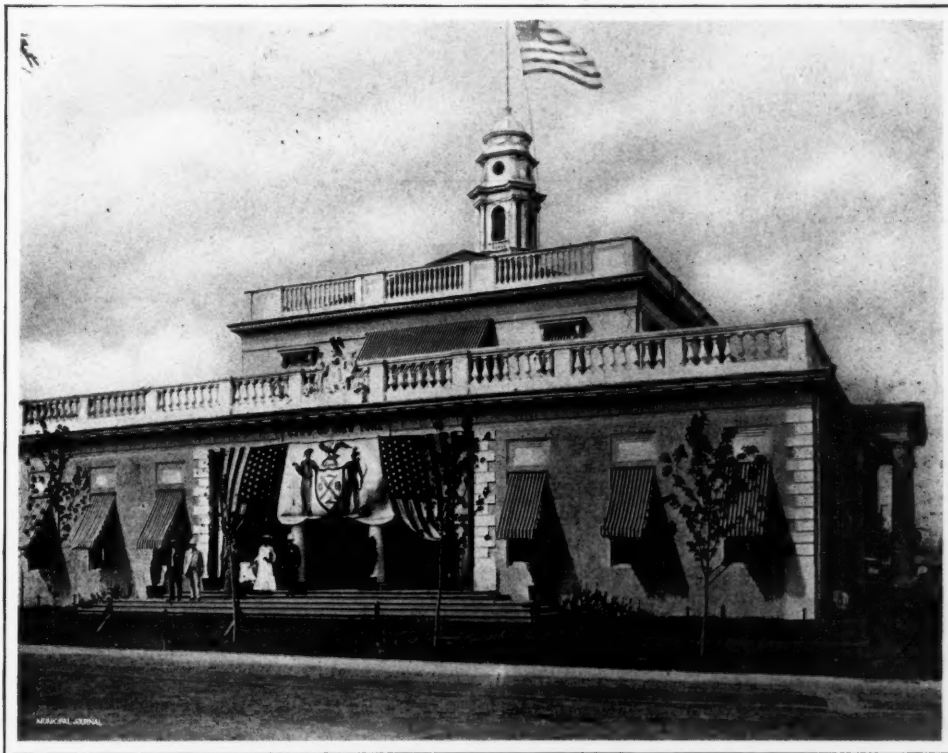
"Sec. 3. It shall be the duty of said inspector to personally inspect all chimneys, or other appliances for the escape of smoke, and to make complaint against any and all persons violating this ordinance.

"Sec. 4. Any owner, agent, lessee, or manager of any building, boat, locomotive, or other structure in the city of Detroit, who shall cause or permit dense smoke containing soot or other substances as above, to be emitted from such structure, or from any other place which said soot or other

substance shall damage or injure the health of any person, or shall especially annoy the public, shall on complaint of any person so damaged or injured as aforesaid, or on complaint of the said smoke inspector of the city, be liable for each and every such offense to a fine of not less than ten dollars nor more than one hundred, or to imprisonment in the House of Correction not less than ten days, nor more than thirty days, or to both such fine and imprisonment, in the discretion of the court."

The Demand for Engineers

"THE number of engineering positions in a great city may occasion some surprise to those not familiar with the facts," said Nelson P. Lewis, Engineer of the Board of Estimate and Apportionment of New York City, to a MUNICIPAL JOURNAL representative. "In the City of New York there are at present more than 1,000 technical employees of the grade of rodman and higher, including those engaged in architectural work, for all of which the Civil Service examination is such that good technical training is required. There has recently been organized in the City of New York an association confined to the engineers now employed by the city, and which now numbers between three and four hundred members.



NEW YORK CITY BUILDING AT WORLD'S FAIR

"In the matter of salaries, the large cities are liberal, especially New York, whose civil list contains the names of one engineer whose salary is \$15,000, one at \$12,000, two at \$10,000, one at \$8,000, four at \$7,500, two at \$7,000, five at \$6,000, six at \$5,000, four at \$4,500, nineteen at \$4,000, twelve at \$3,500, and twenty-seven at \$3,000; there being 117 engineers whose salaries are \$2,500 or more.

"While these salaries are undoubtedly larger than are paid in most other cities, they are also more liberal than are paid by corporations, except in a few conspicuous instances."

Restricting Pneumonia in Michigan

At the meeting of the Michigan State Board of Health July 8, 1904, Secretary Baker presented an account of the work for the restriction of pneumonia in Michigan during the first five months of 1904, and its apparent influence in the lessening of that disease. A brief summary is as follows:

Since January 21, 1904, about 13,500 copies of the leaflet on the "Restriction and Prevention of Pneumonia" have been distributed throughout the State to every locality from which pneumonia has been reported. As most of the reports are secured only after a death has already been reported to

Turning now from the sickness to the deaths—the Bulletin of the Chicago Health Department for the week ending May 7, 1904, referring to consumption and pneumonia, says: "The excessive mortality that has obtained from the two specified diseases since the first of last November still keeps up, and all previous records, both in this city and in New York, have been far distanced this season." Speaking of pneumonia, the Bulletin of the same department for the week ending May 28, 1904, says: "Since November 1, 1903, there have been 3,703 deaths from this cause out of a total of 16,780 deaths from all causes—a proportion of more than one-fifth (22.06 per cent.) of the total mortality."

From the foregoing it is apparent that the winter of 1904 was very exceptional in the mortality from pneumonia. The winter was equally exceptional in the unprecedented long-continued low temperature. By the sickness statistics of Michigan, extending over long periods of years, it has been demonstrated that pneumonia is quantitatively related to low atmospheric temperature—low temperature increasing, and high temperature decreasing the pneumonia; therefore the experience of excessive cold and deaths from pneumonia in Chicago and New York in the winter of 1904 is in harmony with a general law of nature—similar conditions producing similar results. The climatic conditions in Michigan being unusual, similar to those in Chicago and New York, there was reason to expect similar results in the increased death rate from pneumonia. The fact is that in Michigan the increase was not proportioned to the continuance if the extreme low temperature. This is indicated by the mortality statistics of the State Department, and still more strongly by the sickness statis-



THE MODEL TOWN HALL AT THE WORLD'S FAIR

the State Department, the deaths from pneumonia cannot be decreased as much as is the sickness, because the leaflet of information is sent to each locality, and *disinfection is induced thereby* only after one death has already occurred. Still a wonderful showing has been made, considering that as the climatic conditions were unusually favorable for the spreading of the disease, the number of deaths would undoubtedly have increased greatly had it not been for the restrictive measures used by the health officers in dealing with the outbreaks. This will appear below. Considering first the sickness, a comparison of the percentage of weekly card reports of sickness which stated the presence of the disease in Michigan in the months of January to May, 1904, inclusive, with the average in the corresponding months of the six years, 1898-1903, demonstrates that during the first five months of 1904 there was an average decrease of 40 per cent. in the sickness from pneumonia.

tics collected by the State Board of Health. But in order to bring the subject to a mathematical demonstration, it is necessary to combine these statistics with those on meteorology. This has been done, as follows:

It having been proved that the pneumonia is proportional, inversely, to the atmospheric temperature, the increase of pneumonia following the change from the warmest to the coldest month, we first find exactly how many degrees of change in temperature correspond to the average increase of pneumonia, and exactly how much the average increase is. Then, if the average difference between the July temperature and the January temperature causes a given increase in the pneumonia, how much increase should occur from a difference of a given number of degrees of temperature lower than the average? Applying this method to the existing facts, it is found that there actually occurred in Michigan in the first five months of 1904, 136 less deaths than would have

occurred if the same ratio of deaths to atmospheric temperature had prevailed as the average during the preceding six years.

No amount of money could weigh against the lives of these persons saved to their friends and to the State, and it is quite possible that one of them may at some future time be President of the United States or in some other way a great public benefactor; but if the persons whose lives were thus saved were worth, for what they would earn thereafter more than required for their support, as much as one thousand dollars each (before the war of 1861-5 an average slave was valued at that), then there was a saving of money value equal to \$136,000. The courts usually allow about five thousand dollars to be paid by corporations responsible for the death of a person; at that rate of valuation the saving during the five months was over half a million dollars. Anyway the subject is viewed, it is quite apparent that public health work of this sort is exceedingly profitable.

Boards of Public Service Officers

THE Boards of Public Service of Ohio which recently held their convention in the city of Toledo elected the following officers for the coming year:

H. O. Pond, Columbus, O., president; Charles Krone, Hamilton, O., vice-president; Charles H. Frank, Columbus, O., secretary; H. M. Andress, Elyria, treasurer. The members of the executive committee are John Hollberg, Toledo, O.; Samuel Weil, Jr., Cincinnati, O.; Albert R. Murphy, Mansfield, O.; George J. Vetter, Youngstown, O.; John P. Pogue, Findlay, O.; F. T. Evans, Delaware, O., and J. H. Riley, Marietta, O.

Asphalt Paving in Santiago, Chile

THE municipality of Santiago has just made a contract with the South American Asphalt Paving Company (the South American branch of the Barber Asphalt Paving Company) for paving with asphalt 130,000 square meters (1,399,320 square feet) of the city's streets.

The awarding of this contract is the first step in the carrying out of a general plan for improved drainage and roadways in the city of Santiago, the roadway improvement to consist of the above-mentioned portion in asphalt, 100,000 square meters (1,076,400 square feet) of asphalt additional to be provided by the parties receiving the contract for the new sewerage system, 842,604 square meters (9,069,789 square feet) of stone pavement on a concrete base, and 208,500 square meters (2,244,294 square feet) of macadam pavement.

The expense of paving is to be met by an issue of municipal 6 per cent. bonds, authorized by Federal statutes to be amortized at the rate of 2 per cent. annually, the interest and amortization charges to be met by a tax on vehicles.

The 130,000 meters of asphalt paving contracted for by the South American Asphalt Paving Company comprise one side of the Alameda (the principal longitudinal thoroughfare), the more important transverse thoroughfares, and the streets of the business section. The pavement is to be

standard—twelve centimeters (4.72 inches) of concrete base, four centimeters (1.57 inches) of "binder," and five centimeters (1.97 inches) of wearing surface. The price is to be \$13.97 Chilean paper (\$4.67 United States currency) a square meter (10.76 square feet), with additional compensation for extra grade. The contracting company is to provide new granite curb for most of the streets to be paved, at the price of \$3.65 Chilean (about \$1.22 United States currency) a linear meter (39.37 inches). The company has given a free guaranty of maintenance for the first five years and may, at its option, contract to maintain its pavement in good condition for the following five years at the price of \$0.18 Chilean (6 cents United States currency) a square meter and for a further five years at the price of \$0.25 Chilean (approximately 8½ cents United States currency) a square meter.

Fireproof Construction

PROFESSOR S. N. WILLIAMS, of Mount Vernon, Ia., in a recent address remarked that the colossal loss of life caused by the burning of the Iroquois theater in Chicago and the great number of smaller disasters occasioned by the burning of hotels, flats, manufactories and other buildings, seem very emphatic reasons why our entire system of building construction should be revised and made to comply with the demands of modern civilization. The unspeakable horror of death by being burned alive has been impressed on human consciousness for centuries past, and yet events of the past few weeks have more than ever emphasized the criminal carelessness and negligence shown in prevailing architectural methods and the necessity for increasing use of fireproof materials. Some time ago, Iowa's beautiful capitol, the pride of the entire State, was carelessly fired and the papers stated would have been destroyed at a loss of three million dollars had it not been for the energetic action of Governor Cummins. It is really a fire-proof building, yet \$150,000 damage was done. The wasteful destruction of our forest supplies and the enormous annual loss to our country by fire, make a more imperative demand that stone, concrete, steel, brick, terra cotta, and all other forms of indestructible material be used in our building construction.

Growing Popularity of Acetylene Lighting

ACETYLENE GAS plants for general public lighting are being operated in a number of towns in Ontario, Canada. This gas is admirably adapted for the lighting of small communities. There is an unfounded prejudice against it, but it is gradually dying out. Acetylene gas has the advantage that the pipes conveying it are always dry, will not freeze, and may therefore be laid in very shallow trenches, or even over the surface of the ground. Other advantages of acetylene over ordinary gas are that the former is less poisonous, the cost of constructing and maintaining a plant is less, and the lights do not pollute the air to the same extent as ordinary gas. Unless operated by water-power, few electric plants in small places give an all-day service, whereas gas is always available. In North Bay the price of 100 feet of acetylene gas, equal, it is estimated, to 1,000 feet of coal gas, is \$1.53 net.

An Automobile Street Sprinkler*

THE city of Paris is now using an automatic street sprinkler of improved design. It is intended to be used on some of the main avenues, where a rapid and effective method of sprinkling has long been desired. The automobile sprinkler has now been in use for some time and has proved quite satisfactory, being much superior to the horse sprinklers which are generally employed throughout the city.

The new car which is shown in the different engravings is a steam tractor of the De Dion type having a 35-horse-



THE AUTOMOBILE SPRINKLER UNDER WAY

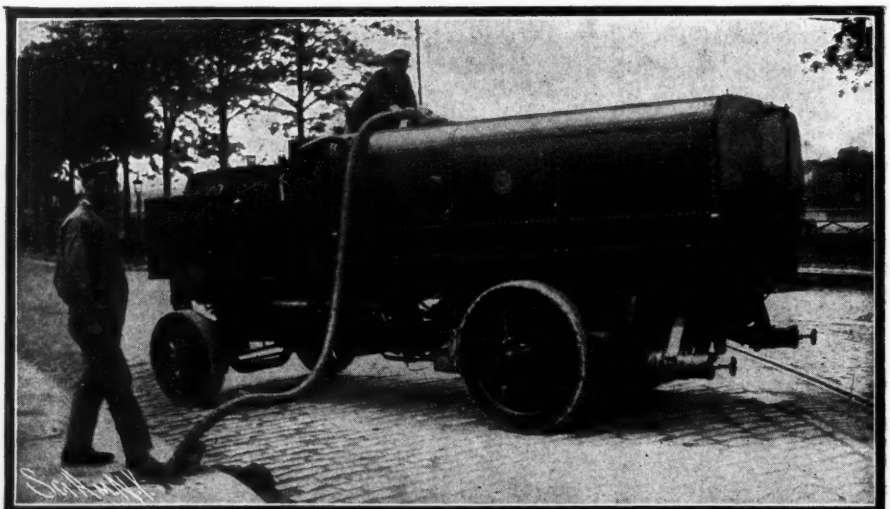
power steam engine. It is equipped with a centrally-heated tubular boiler, placed on the front of the chassis. In the central part of the chassis is mounted a horizontal compound steam engine. The movement is transmitted to the rear axle by a universally jointed shaft with bevel gear drive at the differential, somewhat as in the smaller automobiles. The water tank, boiler, and all the controlling apparatus are placed in the front of the car, while the rear platform has mounted on it a large water reservoir of five tons capacity for the sprinkling device. This water tank is arranged so that it can be removed from the chassis, which allows the car to be used as an ordinary tractor or hauling wagon, thus increasing its sphere of usefulness.

The distance between axles is 10 feet, 10 inches and the track is 6 feet. The front and rear wheels are 40 and 60 inches in diameter respectively. The rear platform is 4 feet, 8 inches from the ground. When complete, the sprinkler weighs 6 tons, including the water tank, and the speed varies from 5 to 7 miles an hour. The best speed for watering the streets has been found to be 5.4 miles an hour, and the car is now regulated to run at this speed.

The mechanism of the sprinkler has been well designed. The water reservoir for the boiler, which is built of steel plate,

connects with the main water tank, and both are filled by the same operation. The water passes from the main tank through a small pipe to a centrifugal pump, which lies underneath and behind the rear axle. A chain and sprocket transmission drives the pump from the rear axle of the car at a speed which is always proportional to that of the driving wheels. As the car travels at the uniform speed of 5.4 miles an hour, the speed of the pump is kept constant. A cone friction-clutch enables the driver to throw on the pump for operating the sprinkler when the car arrives on the spot, and the reversal of the lever throws it off and stops the water stream. A valve is disposed beside the pump, so that in case of need, all the water delivered by the pump can be returned direct to the tank through a suitable pipe. By operating this valve, the driver can make different combinations according to the position of the lever. Thus the water can be sent into the two sprinkling nozzles, or it can be returned to the tank when the sprinkling is stopped. Means are also provided to use only one of the sprinklers at a time. In the latter case the surplus water is returned to the tank through a pipe which, however, has only a narrow passage for the water, so that the pressure shall not fall below the proper limit.

The sprinkling nozzles have been constructed on a new design. The water arrives through a pipe and flows over an inclined plate, from which it spreads in sheets and falls into a semi-cylindrical chamber, whence it escapes by a set of holes in the sides. A screw, operated from the outside by a hand-wheel, regulates the amount of sprinkling. A piston, operated from the hand-wheel, is moved forward or back and the total section of the water orifices is made to correspond once for all to the pressure obtained by the pump, given the width of sprinkling which is required. To work such a car successfully, the above elements had to be combined with the speed when on the road and the volume of water needed to cover a square yard of ground.



FILLING UP THE TANK OF THE AUTOMOBILE STREET SPRINKLER

* By courtesy of the *Scientific American*, the article being by the Paris correspondent of that journal.

This has been well carried out in the present case, and it is found a practical and economical apparatus. The water comes out in two symmetrical sheets 23 feet wide, and it thus sprinkles a surface 46 feet wide. On the other hand, the 1,250 gallons which the tank contains will water a distance of 0.6 mile. This gives the car a sprinkling capacity of about 1,700 square yards, and this can be covered in a quarter of an hour.

Profits in Municipal Ownership

IN discussing the subject of profits in municipal ownership it is only necessary to look at the facts in order to be convinced of the possibilities in that direction.

The Municipal Electric Light service has been in operation in Chicago for sixteen years and the city felicitates itself upon the outcome of the enterprise undertaken in 1888. Not a few of Chicago's shrewdest men took an unfavorable view of the project when it was mooted, but the advocates of municipal ownership were able to carry their point, being assisted in their plans by the splendid showing which the city's waterworks make annually, the net earnings of the same reaching nearly \$2,000,000.

City Electrician Ellicott has completed the annual report and we glean from it the following facts:

For the year just closed the system exhibits a profit of \$297,048.

In sixteen years of municipal ownership the city has spent for construction and operation \$3,720,099.

The total cost for all kinds of city lighting is much less now than in 1896, although the candle power supplied has been largely increased. In 1895 the cost was \$1,098,220, and light equal to 3,964,000 candle power was furnished. By 1900 the cost had fallen to \$919,163, and the candle power risen to 9,513,400. In 1903 the cost was only \$916,212, and the lamps of all kinds were of 12,269,000 candle power. The total amount spent on the city electric lighting plant in 1903 was \$258,454.

Such facts as these speak more eloquently for municipal ownership than would the most florid rhetoric.

Asbury Park's Enterprising Mayor

THE Mayor of Asbury Park, N. J., is a firm believer in publicity and competition. It was the keynote of his letter of acceptance and he is closely following up his policy of urging local competition in public utilities. The mayor has had the following notice published in the Sunday edition of the New York *Herald* under the heading of "Business Opportunities:"

"Asbury Park, New Jersey, invites bids for Gas, Electric Light and Telephone franchises. Asbury Park is to-day the commercial center of famed Monmouth county, is surrounded by populous communities and with the further contemplated (under way) public improvements (\$250,000 already expended on its million dollar ocean front), bids fair to become the foremost all the year round resort in the country. Many other opportunities await capital in this favored spot, viz.: Greater hotel facilities, a new ocean pier, etc.

"Address F. L. TEN BROECK, Mayor."

Waste of City Water in Spokane

Mr. John C. Garvin of Spokane, Wash., makes the following plea for the introduction of water meters in that city:

"I have heard and read a good many arguments for and against meters and, as I am an interested taxpayer, I have come to the conclusion that the taxpayers of Spokane will not think the time wasted reading my view of the subject.

"I have heard several persons express themselves strongly against the use of meters, their principal argument being if meters were used many people would not use the water in sufficient quantity to keep themselves clean or their lawns in good order.

"These individuals claim to have great love for the beauty and welfare of our city, but without exception I find they are all large consumers of water themselves. And the same logic might also be applied to the use of meters for gas and electricity. In all other things each person has to pay for what they get, and I believe they should not have to pay for what others get.

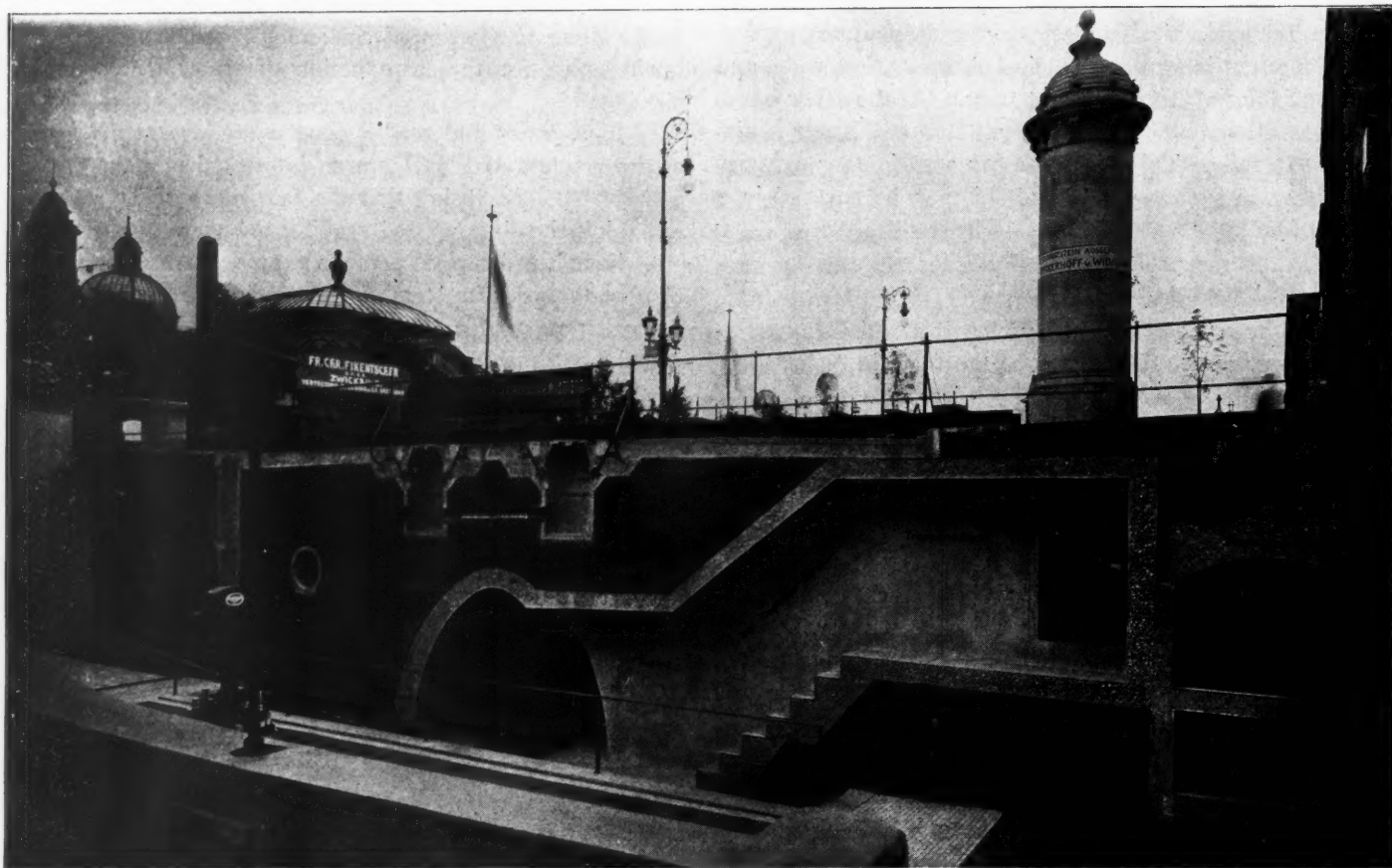
"If it is good for other cities to have meters, it is just as good and better for Spokane, and the reason I believe it is better for Spokane is that the conditions beneath and around our city are different. Only a small part of the city is built on land that requires little water to keep the lawns green; more of it is built on gravel that will let water through it like a sieve. Here is what the city fathers have to take into account.

"It has been said if the money spent on meters were spent on a reservoir there would be plenty of water for everybody and the fire department would never run short. In my opinion, if double the amount spent on meters were spent on a reservoir and no meters used, taking the growth of the city into consideration, I believe the city would soon be in a worse fix for the want of water than it is at the present time, because of the increase in the responsibility, the waste and extravagant use of water by some people.

"What induced me to become a citizen of Spokane was the beautiful falls, a large river with a never failing supply of clear water running through the center. Here, I thought, is an ideal site for a large and beautiful city, which should have the cheapest and best water of any city in the world, because Coeur d'Alene lake is our great natural settler and reservoir for the city.

"The people of Spokane should not allow any sawmills or anything else to contaminate the water between the lake and the pumping station.

"I am pleased to hear that the city fathers are going to employ a competent engineer to look over the situation and advise the best manner of supplying plenty of cheap water to the city. In looking over the ground I would suggest that the engineer go up on the hill southeast of the city. There he will find natural reservoirs (small lakes, which were full of water when I saw them in May). If these were utilized the city would not have to go to the expense of building any more steel tanks on the south side of the river. I believe the city fathers should have the engineer also go up the river and make a report with regard to the economy of supplying the city with water by flume instead of by pumps."



A PART OF THE DRESDEN, GERMANY, MUNICIPAL EXHIBIT

The Mobile of the Future

Mayor Pat J. Lyons of Mobile, Ala., wisely looks beyond the present to the future development of his city. In his message to the Council he said:

"It seems to be manifest to every one who has observed anything of the recent growth of Mobile, or who has, at all, considered the causes which have given to it such impetus, that Mobile is destined rapidly to become a great city; and that this is as well assured as the building of the Isthmian Canal is certain. It therefore behooves those who must conduct the affairs of the city, to prepare for its future necessities as well as to provide for those of the present, for it is as unwise for a city to live from hand to mouth as it is for an individual. In a city no larger than Mobile now is, it may be hard to realize that the question of fresh air will ever become a problem difficult to provide for, but it is as difficult in a city of any magnitude to understand how such a necessity could have ever been doubted. It cannot be a great many years before the necessity for a public park of greater magnitude than anything which has, as yet, been provided for, will be seriously felt; and I recommend that your honorable body take up this matter for serious investigation and consideration.

"Mobile is perhaps better known for its Bay Shell Road than by any other possession; and the importance of preserving this luxury to our people cannot be overestimated. The resident portion of the city of Mobile is rapidly moving towards the west; and the approaches to Shell Road, which

have heretofore been used, are rapidly becoming ill adapted.

"At the time of the construction of the city water works, although but a short time ago, it was thought that any water pressure which would throw a stream as high as the Battle House would be entirely adequate for the needs of the city. Even now it seems strange that we did not realize how soon the people of Mobile would begin to erect structures of much greater height. There are now in process of construction several buildings six or seven stories in height, and others still higher will shortly follow. The water pressure is not now sufficient for the protection of these new buildings; and I take pleasure in informing you in accordance with your instructions that a contract has been executed for two new steam engines for use in this city, with sufficient power to throw water over the tallest buildings.

"There is no municipal policy better established than that of acquiring and keeping open sufficient streets to furnish easy access from every portion to every other portion of the city. There has been a great development in Mobile in the opening of streets in recent years; and it is now being pushed forward in the suburbs with even greater rapidity. There are many places, however, in the city of Mobile where streets are sorely needed. There are many places where dedicated streets have been closed by private persons and permitted to remain closed; and but little attention is being paid to the regularity of system upon which the new streets are being opened. I direct your attention to this fact; and I shall attempt myself to give this matter proper investigation and consideration."

Asphalt Reorganization

By a settlement perfected on October 19, all opposition to the plan for the reorganization of the Asphalt Company of America and the National Asphalt Company, under the name of the General Asphalt Company, was removed.

Under an agreement between Attorney John Douglass Brown, counsel for William C. Bullitt, who represented thirty of the bondholders of the Asphalt Company of America, and another attorney, who is believed to be acting for the men back of the movement for reorganization, all the bonds of dissenting holders, valued originally at \$310,000, have been sold for 54 per cent.

After the costs have been deducted the thirty bondholders represented by Mr. Bullitt will receive \$500 for each \$1,000 bond. When the third plan of reorganization of the Asphalt company was proposed these bondholders had an offer of exactly \$145 for each \$1,000 bond. So, under the settlement just reached, they gain \$355 on each bond.

With the retirement of Mr. Bullitt and his thirty dissenting bondholders, it is believed that the last vestige of opposition to the reorganization of the company has been brushed aside.

Facts About Kansas City

COL. R. H. HUNT, the custodian of the Kansas City Casino, at the World's Fair, furnishes some pungent facts about Kansas City, which has been built since the Civil War and now with its tributary territory produces 21 per cent. of the wheat of the United States, 32 per cent. of the sheep, 35 per cent. of the horses and mules, 39 per cent. of the hogs, 40 per cent. of the cattle, 43 per cent. of the oats, 45 per cent. of the cotton, and 51 per cent. of the corn. The value of the annual product of the farm and ranch in Kansas City's tributary territory exceeds one thousand million dollars. The value of live stock on the farm and ranch in that territory is six hundred and twenty-three million dollars. The city ranks 17th in population, 15th in factory products, 13th in postal receipts, 10th in bank clearings, 3d in telegraphic business, 3d in horses and mules, 2d in railroads, 2d in meat packing, 2d in grain receipts (primary), 2d in live stock, 2d in lumber, 2d in health, 1st in Pullman business, 1st in agricultural implements, 1st in farming territory, 1st in tributary trade territory.

Kansas City has a population of 250,000, 2,289 factories, bank deposits of \$82,000,000, 18 systems with 32 distinct lines of railroads, annual bank clearings of one thousand million dollars, 78 per cent. of native born white population, 54 ward schools, 4 high schools, 179 churches, 26 miles of boulevards, 215 acres of parkways, 1,874 acres of parks, 193 miles of paved streets. It has within 15 years made and paid for street, boulevard and park improvements costing \$18,000,000. It has the lowest rate of general taxation of any city in the United States. It has more high-school scholars in proportion to the population than any other large city in the United States, and has within 150 miles a population of 2,800,000. It has within 150 miles several coal, oil, gas, zinc and lead-producing districts. It has one-fourth of the United States to draw from and one-half of the United States to sell to.

Abolition of Billboards

A RECENT storm sounded the death knell of the bill board at St. Paul, Minn., by blowing over a large number of such boards in the city. They cannot be reconstructed because Mr. Winn Powers at a special meeting of the assembly, introduced an ordinance which provides that all billboards and bulletin boards for advertising purposes shall be placed fifty feet from the street. This means practically the abolition of nearly all the billboards in the business portions of the city and in the thickly resident portions where the buildings would obstruct the view of the board if it is placed fifty feet from the street.

The ordinance was passed, under suspension of the rules, by both bodies of the city council.

Assemblyman Schiffmann, while stating that he would vote for the measure, suggested humorously that fifty feet meant the abolition of the billboard.

Assemblyman Powers represents a district in which billboards were numerous and several times has planned the abolition of the boards from the prominent positions in the streets. The assemblyman realized that as the boards are nearly all down this is a good time for getting rid of them without unnecessary expense to the owners.

The ordinance is as follows:

"The common council of the city of St. Paul do ordain as follows:

"Section 1. That hereafter no billboard shall be erected, constructed or reconstructed within fifty feet of any street in the city of St. Paul.

"Sec. 2. Any person who shall violate the terms of this ordinance shall be punished by a fine of not more than \$100 or by imprisonment for not more than thirty days."

This means that nearly every board in the city will have to be moved back fifty feet from the street front. There is hardly a board in the city which has not been partially destroyed and under the ordinance it cannot be reconstructed unless set back fifty feet.

Street Watering in Lynn

THE Deputy Street Commissioner of Lynn, Mass., Mr. C. A. Magill, suggests the advisability of the city doing its own street sprinkling. The cost of this work under contract has been \$21,219.42. Forty-seven million five hundred thousand gallons of water have been used. The receipts from assessments have been \$18,186.28. The work was done by contract with the American Car Sprinkler Co.

The Commissioner believes his division could do the work at less cost and more thoroughly. The first year the cost of the equipment would probably be so great as to preclude saving, but in succeeding years there would be great saving. There are forty-two miles of streets sprinkled at a cost of about \$22,000, or about \$524 per mile. Some of the streets are only sprinkled twice daily and in order to keep the dust down are oversoaked with water, causing damage to the road surface. The Commissioner says that the present appropriation would allow for fifteen teams at \$4 per day for the entire 365 days of the year, to say nothing of what use could be made of the teams on days that did not require sprinkling in the summer, and their use in the winter on snow, etc.

Wide Tires Compulsory in Topeka

THE city ordinance passed last December in Topeka, Kansas, compelling teamsters hauling heavy loads within the city limits to use wide tires on their wagons, went into effect on September 1. Arrests will follow its violation.

The original ordinance was passed last year and prescribed wide tires for wagons carrying 4,000 pounds or over. The penalty for its violation is from \$5 to \$50. The latter part of the winter an arrest was made for test purposes. It was taken before Judge Hazen, who held the law good, although in handing down his opinion he said that he thought it worked a hardship on teamsters. He enforced the fine which was assessed by the police court against the man who was arrested.

The enforcement of the ordinance was then to be vigorously prosecuted, but the teamsters waited upon the council through a committee, and asked that time be allowed them to get the tires on their wagons. That occurred during the first week in April. The council consequently agreed to give them until September 1, before active enforcement of the law was to take place.

Chief Stahl has been instructed to make arrests wherever he finds the law violated, and without question the police court will get additional business from that source.

It is not thought that the case will be tested in the courts. There was some talk at the time of Judge Hazen's decision to carry the matter to the supreme court but nothing ever came of it.

Technically the law under which the city will act is a new one, but in reality it is a copy of the old. The council erased the former one from the city ordinances and then passed one

like it after the teamsters asked for an extension of time until its active enforcement was to be commenced.

The law was passed to protect the paved streets in the city. Narrow tires on a heavily loaded wagon do considerable damage. That was demonstrated when Ringling Brothers' show hauled its paraphernalia west on Tenth street and practically ruined the asphalt on the north side of the street. The tires on circus wagons are a little wider than those ordinarily used but not of the four inch variety which the city demands.

Device for Street Car Ventilation

Dr. Walker, of the health department of Brooklyn, has devised a simple method for ventilating street cars without causing a draught. He had two openings made in the deck-sash of a car about ten inches apart, into which were fitted slats to deflect the intake of air to the roof of the car. Between these openings a shingle was extended from the side of the car, so the wind would strike against it when the car was in motion. The principle on which he proceeded was that air would strike the front of the shingle and be deflected into the car, while dust, cinders, etc., would fall to the ground. Simultaneously the forward motion would create a vacuum in the rear, which would suck out the vitiated air of the car through the rear slats. The cold, fresh air introduced would sink toward the floor, and the heated and vitiated air would rise and pass out. He had rags and refuse burned in the car until the atmosphere was rendered absolutely unbearable. The car was then set in motion at a speed of fifteen to eighteen miles an hour, and within two minutes and a half the air within was fresh and pure.



A SUGGESTION FROM A GERMAN CITY

INCIDENTAL ITEMS OF INTEREST

Many Matters of Moment to Municipalities Briefly Told—Short Record of Happenings and Facts in City, Town and Village

* * * Sixteenth street, in Oakland, Cal., is to be oiled for two blocks between Market and Filbert streets, and will then be covered with rock screenings. The step is taken in order to correspond with the same kind of work recently done by the Oakland Transit Company on the portion of Sixteenth street mentioned, between its tracks and for two feet on either side. The result has been declared by several members of the Council to be highly commendable, it having been stated that the portion of the street so treated will compare very favorably with any macadamized street in the city.

* * * Recent Cape Town municipal election returns include one man of color, Dr. Abdurrahman, a Mohammedan graduate of Edinburgh and a very able man.

It is believed that this is the first instance of the return of a man of color to any European representative body in South Africa.

* * * George W. Meredith, town marshal of Princeton, Ind., resigned his position recently in disgust, because his salary was only 75 cents a week. The Town Board refused to increase the compensation.

* * * The city of Atlanta, Ga., has a chemical filtration plant and the filtration of the city's water costs the city the sum of \$1.90 per million gallons. This sum appears insignificant by the side of the proposition of the Nashville Sand Filtration Company to filter water on a sliding scale of from \$14.50 to \$10.50 per million gallons, and instead of a minimum of \$63,000 per year this rate would call for but about \$9,000 per year.

* * * The city of Wilmington, Del., some time ago installed a metallic filtration plant. After a few years it ceased to filter. The city refused to pay and the company flashed the contract between the company and the city to the effect that the city was to "keep up" the plant. Litigation followed and the city lost before every court, finally being compelled to pay for the filter, and for the amount of water that would have been filtered had the city repaired the plant at the beginning.

Not content with this, Wilmington put in another plant, and strange to say, was again "bitten," litigation in the courts ending in the city's defeat.

* * * Lemuel P. Talbot, a former inmate of the Taunton, Mass., almshouse, was left a small sum of money by a relative recently, and the city sought to get it to reimburse itself, but the Supreme Court has decided against it.

* * * In Rochester, N. Y., a new style of badge for police helmets has been ordered. The present badge consists of a wreath. The new badge will have an eagle on top and below will be the rising sun. This is supported by an emblem representing the arches of the aqueduct and other either side the old Roman faces. Below will be a number of the patrolman.

The idea of having the policeman's number on his hel-

met is to render identification easier. At present the badge is worn only on the coat. The new helmets will be worn by the sergeants as well as the patrolmen.

* * * Because he was hit by the falling body of a young girl acrobat attempting to make a sensational "slide for life," M. W. Wheeler, a bystander, is suing the city of Fort Dodge, Ia., for \$20,000 damage. Wheeler was knocked unconscious by the girl's body, many bones broken and internal injuries occasioned. For weeks he hovered between life and death. He finally recovered and is now suing the city.

* * * Ashland, O., the county seat of Ashland county, is the only town in the United States that owns and controls a theater designed and built for theatrical purposes only, the proceeds from which, after all expenses are paid, are turned into the town's treasury.

* * * The public baths at Harriet Island, Minn., which closed Monday, had a better season financially than in 1903, but there was a slight falling off in the number of bathers. The total number of bathers was 185,886, as compared with 188,703 last year. The number of male bathers was 150,476, as compared with 149,533 last year, and the number of female bathers 35,410, as compared with 39,170 last year. The receipts were \$8,567, as compared with \$7,525 last year.

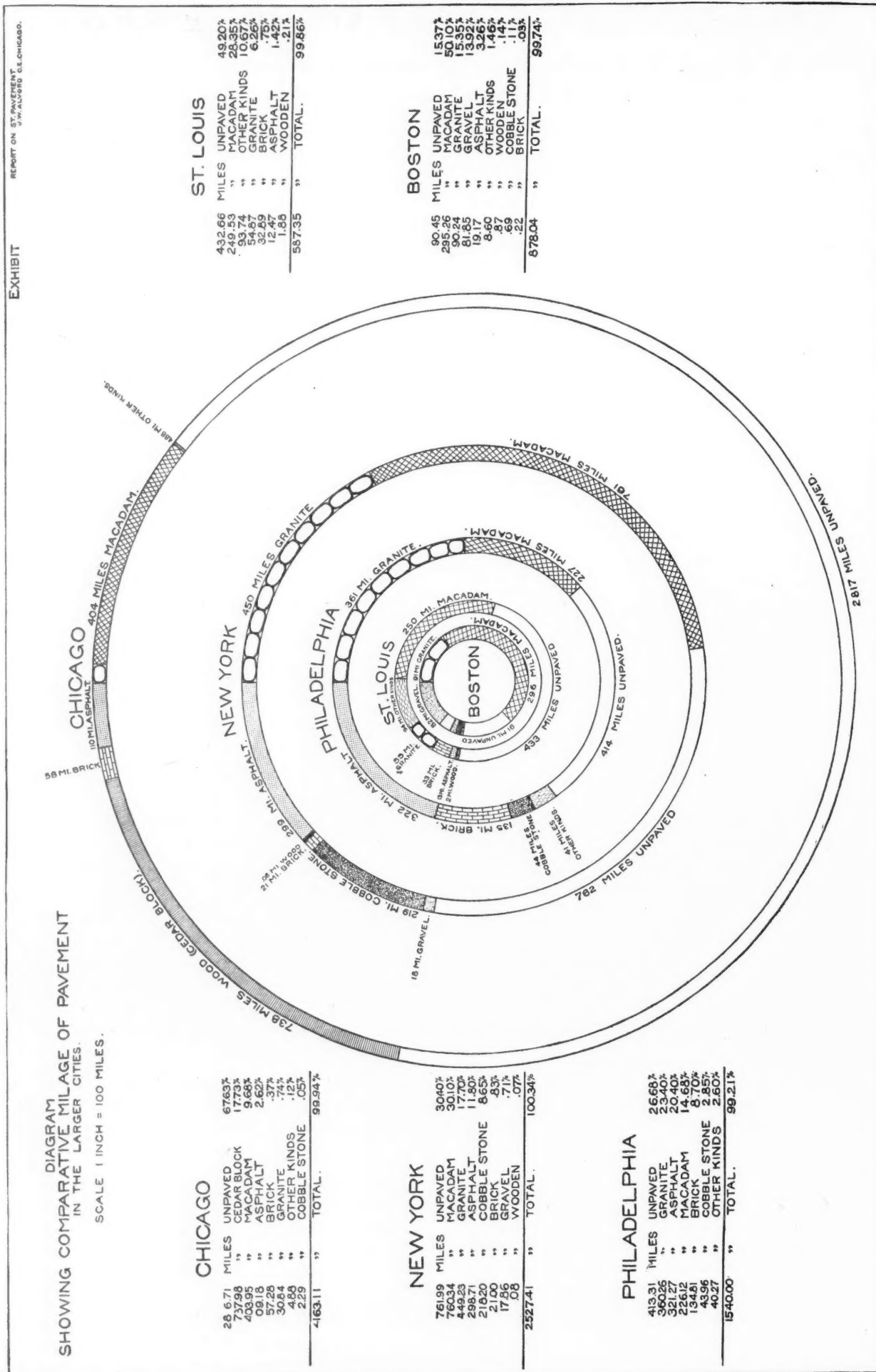
The city allows \$10,000 for the maintenance of the baths and playgrounds, including the gymnasium, picnic grounds, baby nursery and other accommodations. The receipts this season were turned into the city treasury, making the net cost of maintenance a little less than \$1,500.

* * * Milwaukee voted not long ago to install a municipal light plant, and now the lighting plant company that has been furnishing gas to the city finds that it can greatly reduce the price and still make money. They never found it out until the city concluded to make its own lights.

* * * During the coming winter there will be published in America a book written by Mr. Robert Donald on the "Results of Municipal Ownership in England."

* * * Representatives of twenty steam and electric railways were before the Railroad and Warehouse Commission in September, in response to the citation requiring them to show cause why all grade crossings in the State should not be protected with interlocking devices. At the request of the roads it was decided to postpone the hearing thirty days. The Chicago roads will be represented at a similar meeting held in Chicago.

* * * The Committee of Public Safety of Waterbury, Conn., are considering the offer of one of the leading liverymen of the city, which is as follows: He will furnish a model up-to-date patrol wagon, harnesses and horses, and all the other furnishings, and also a day and night man ready to answer all calls, for \$1,700 per year, providing a three or five years contract be given him. If he secures the contract he guarantees to have the wagon ready to answer calls twenty-four hours every day and 365 days in the year.



AN EXCERPT FROM THE REPORT OF JOHN W. ALVORD, C. E., "THE STREET PAVING PROBLEM OF CHICAGO," TO THE COMMERCIAL CLUB OF CHICAGO

THE MANILA FIRE DEPARTMENT

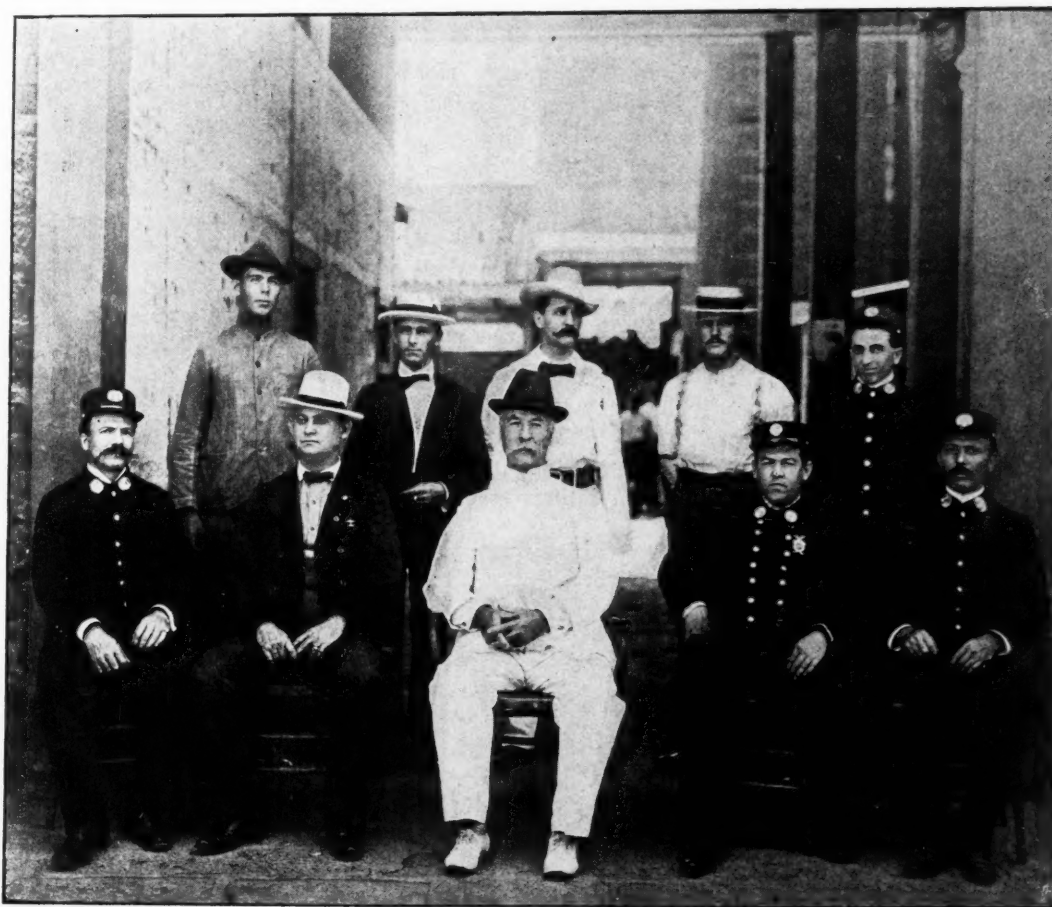
**Its Origin and Evolution, and Its Present Condition, Equipment and Organization—
Its Personnel**

*By Hugh Bonner**

THE origin of the fire fighting organization is apparently lost in the obscurity which overcomes all departments in life that keeps no records and there does not appear to be any available records that would tend to show any form or system of organization having for its object the protection of the city of Manila against fire.

There is, of course, no doubt that some such body existed, as we have found material traces of its being in relics of antiquated apparatus. How far the natives who were found at the fire stations at Paco and Santa Cruz were responsible for the absence of a rational system of fire fighting I do not know, but the probabilities are that they were in no way responsible at all.

The men who were detailed to handle this cumbersome, useless and ancient machinery were in no way to blame for the absence of a proper fire system for the extinguishing of fires. That is chargeable to the government officials who were solely responsible for the condition of affairs in permitting the wanton destruction of property, mainly due to the causes stated. There is no apparent reason why the fire department should have been slighted and mismanaged, depending mainly on other city departments to furnish the aid to operate with in the event of a fire; but this fact is only on a par with all other branches of the city government, as it seems that general mismanagement prevailed everywhere when under the control of city officials—at least, such was



CHIEF BONNER AND ASSOCIATES, MANILA FIRE DEPARTMENT

Several pieces of very ancient apparatus were found in these stations such as hand pumps, hooks and sectional ladders, the latter never being used—nor could they be with any safety to the parties using them. These appliances were handled by a few natives who were eventually reinforced by others, the whole outfit managing to arrive at the scene of the fire just before the final collapse of the building.

* Formerly Chief of New York Fire Department.

the condition of affairs that prevailed previous to the American occupation, and cannot be charged to the Insurrectors, as they never had possession of the city long enough to cause any serious changes during the period of their uprising.

The beginning of a semi-rational method in the matter of extinguishing fires may be said to have been in 1883, when the waterworks were completed and turned over to the city for the use of the inhabitants, the source of supply being the



PART OF EQUIPMENT OF OLD MANILA FIRE DEPARTMENT

Mariquina Valley, distant about eight miles from the city, where is also located the pumping station which is kept in constant use in pumping the city supply of water from this place to El Deposito, located on a high elevation, which permits the water to reach the city under a head of about twenty pounds to the square inch. El Deposito having a capacity of only 15,000,000 gallons per day, or two days' consumption by the city, this capacity, I understand, will be enlarged by the addition of a much greater space for pounding when the additional supply of water is furnished from the mountains, which is contemplated in the near future, as well as the enlarging and doubling of the present supply mains to the city; but this has little to do with the present inadequate supply, which is mostly felt by the Fire Department on the occasion of sudden outbreaks of fire, more particularly in the nippa section, where quick action is a necessity.

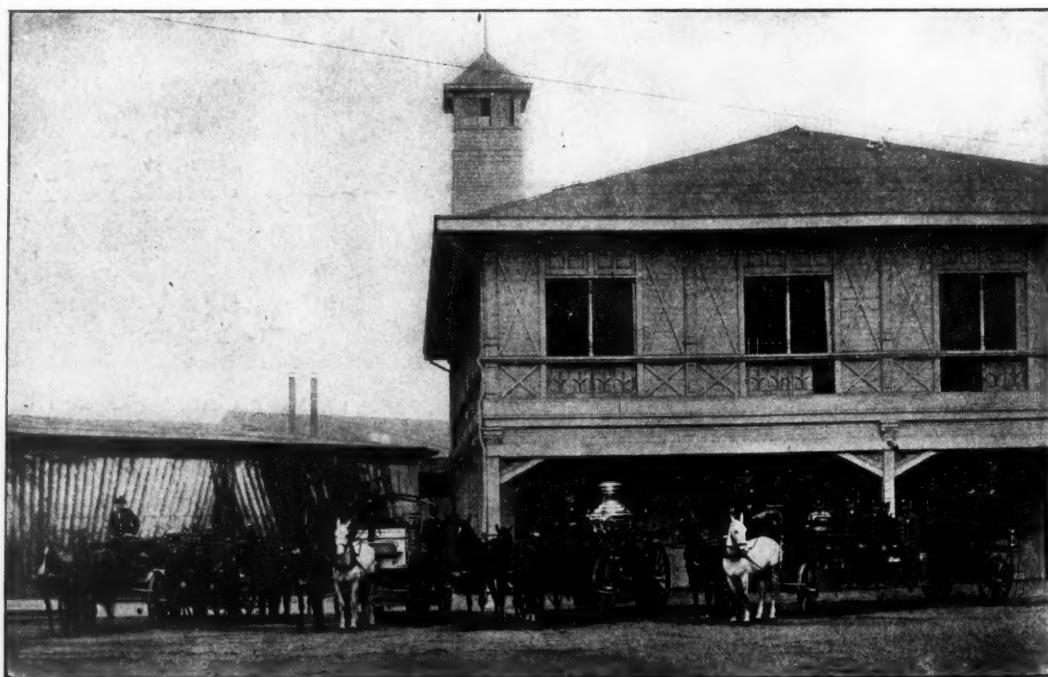
It is now more than two decades since the introduction of the water supply in Manila. At that time, no doubt, many of the small fires were extinguished by the pressure from the mains; but, as the city's population increased and the city extended outward, the pressure became naturally very much less on the water mains, resulting in giving a few small streams at its best for actual use on fires. It was then thought best to obtain hand and steam engines to aid in the extinguishing of fires, which were brought into use mainly to cover the defects of the inefficient water supply then existing, one of such machines being a volunteer company's, manned by the English residents, and later turned over to the city.

In the days of the Spanish regime on the occasion of large fires which often swept the city, more particularly on the two most important thoroughfares, the Rosario and

the Escolta, the Spanish and Chinese business houses were mostly affected; but from what we can learn, neither party was a very great loser, owing to the loose methods involved in placing insurance on risks. It would seem quite an easy matter for those affected to recover the entire losses on stock, and it is safe to say that whatever else the merchants neglected the amount of insurance was always equal to the full value of the stock on the premises, and was, as a rule, always ready for any emergencies that might arise, owing to the disturbed condition of affairs in the city and its suburbs.

To keep up an insurance and carry a full line of policies on stock was considered a good business transaction in the absence of any system of organization that might be classed as a fire department, or the means to extinguish incipient fires—although, as stated, there were a number of natives found in the various stations who were, on the occasions of fires, reinforced by others from various city departments, and the whole under the command of a Spanish official of unknown ability in the art of extinguishing fires.

Many amusing tales are related at the expense of the fire force as it then existed, previous to and after the occupation of the city by the American troops, more particularly on the occasions of fires and alarms, no doubt owing mainly to the peculiar methods and antics of men and apparatus in proceeding to fires and responding to calls, and their actions on arrival at the scene of trouble. The history of such cases, as related by old residents, must have been ludicrous: to witness the mobilizing of Spaniards and natives with ponies and apparatus, the men gesticulating at each other as to the best means of handling the conflagration; for it usually at-



SAN NICOLAS FIRE STATION AND APPARATUS, MANILA FIRE DEPARTMENT



NATIVE FIREMEN AND PONIES OF THE OLD MANILA FIRE DEPARTMENT

tained such proportions, owing entirely to the utter demoralization of the force—resulting in the total destruction of the building where the fire started, and often consuming blocks in addition. The scenes enacted on such occasions might be classed as a full-dress rehearsal, and were certainly equal, if not superior, to the scenes depicted in the plates representing the Darktown Fire Brigade in action. Such conditions could only be attributed to the government in charge and in possession of the city of Manila at and during the time of the great destruction of property and the utter demoralization of the fire fighting force.

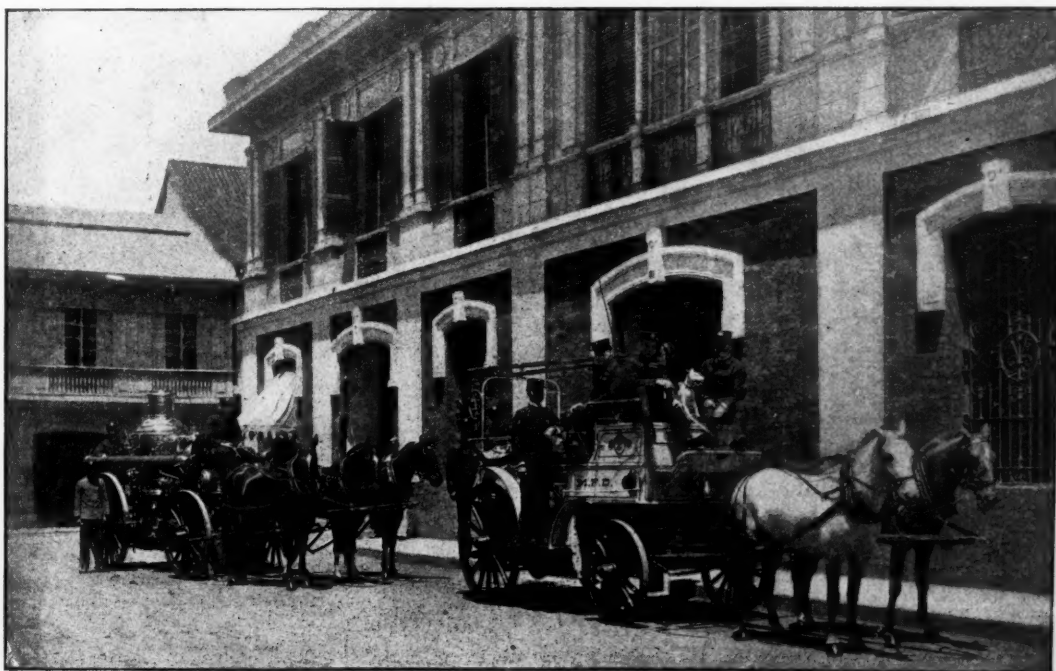
This was the condition of affairs at the time that the Provost Marshal assumed entire charge of the apparatus and placed men in charge who had some knowledge in the matter of extinguishing fires, meeting with some success—at least, as much as could be expected from the use of such antiquated machinery as they were compelled to operate with at times. It was then turned over to the Municipal authorities on the organization of the Municipal Board, who immediately proceeded to reorganize the department on a solid American basis, by ordering American apparatus and machinery, and fire alarm system of the most improved type, including chemical engines, implements, life-saving appliances—in fact, everything that would tend to make a complete outfit for the organization. American horses were also introduced to haul the apparatus, and American drivers put in charge, leaving to the Filipinos the care and driving of ponies and the filling of less important positions to the extent of more than one-half of the entire force, and the whole under the command of a chief of some experience, who selected the most available men from among the Americans to fill the minor positions, such as foremen, assistant foremen and engineers of steamers, drivers and assist-

ants. It is but fair to say that the Filipinos—at least those who can talk our language—make a fair showing as firemen. There are certainly a few who stand up and take their medicine when work is to be done, and I have seen them stay and fight the elements equally as well as any of the white-skins; but, of course, this is the exception, as the native was never intended for a fireman, although he is willing to try, and usually is obedient and attentive to duty.

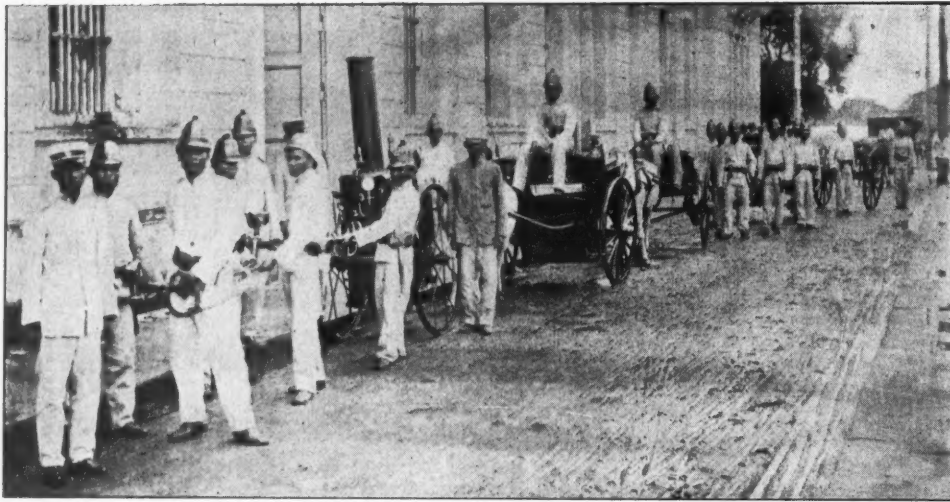
It is generally conceded by the authorities and the people of Manila

that the Fire Department during the past two years has by long odds far exceeded all other departments of the City Government in the line of rapid advancement in the system of organization, improvements and discipline of its working force, and is at present the most perfectly equipped and efficient fire department to be found anywhere in the Far East, and will compare most favorably with any department of its size in the United States in its system of organization, equipment and efficiency.

It is of the utmost importance to the city of Manila to keep up this standard of efficiency, for it must always be remembered that the city is a combustible one, being constructed mainly of wood with the large sprinkling of nippa construction, and will not permit of any lax methods in managing or handling its fire department, as such a condition would easily result in a repetition of the sweeping fires of the past; but, with the department kept up to a proper standard of efficiency, I feel confident that no extensive fires would visit Manila, and, with an additional water supply, will eventually be able to prevent those great and quick fires among the nippa settlements which cause such havoc among the natives and sweep everything before them, fires greater



MODERN ENGINE AND HOSE WAGON OF NEW MANILA FIRE DEPARTMENT



OLD HEADQUARTERS OF MANILA FIRE DEPARTMENT

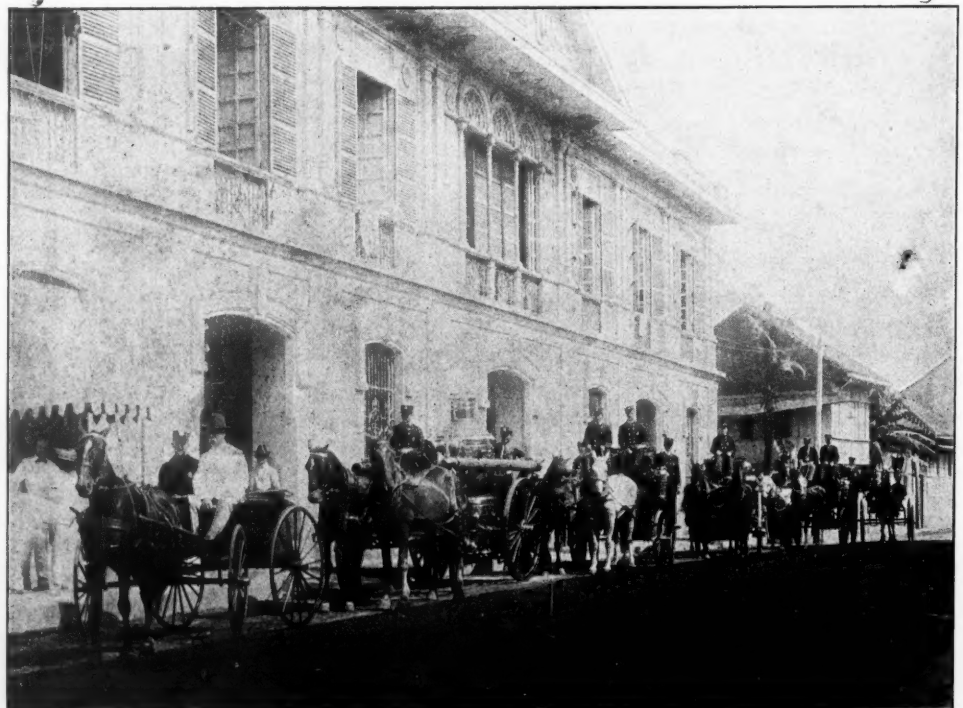
in extent than those of the prairies that cause such destruction when started on our western plains. Nevertheless, the native is careless, notwithstanding his many experiences with extensive fires in the nippa districts, and is without doubt the most reckless in regard to fire and its prevention. This of course applies to the natives of the lower class, who do not in a measure realize the danger or know how to handle much of the explosive oils that are now brought into use for lighting purposes; and until such time as the native realizes that there is danger in his lax methods of handling, and permitting fire in the immediate vicinity of them, there will always be great fires sweeping out of existence those colonies of nipa shacks that are so thickly populated and built so closely together that it makes it next to impossible to prevent the rapid destruction, more particularly during the summer season when the sun beats down upon the nipa roofs for months at a time without the slightest rainfall during such period, leaving the structures susceptible to the slightest spark or neglect in handling fire—in fact, they are nothing but a cluster of tinder, made so from the effects of the heat of a tropical sun that may be counted upon to be found up in the 90's about every day while the season lasts.

Doubtless the Fire Department of Manila can claim to be a very ancient organization; I am forced to this conclusion by the evident antiquity of the appliances left in my charge to operate in extinguishing fires. I am unable to find any records as to the date of the original organization of the Fire Department, but it is a very ancient institution, judged by the machines and appliances used in extinguishing fires at the time of their surrender to the American forces by the Spanish Government. Formerly the Department was evidently operated by natives, commanded by Spanish officers; but to

what extent they succeeded in extinguishing fires we are unable to say, and can only form an opinion as to its efficiency from the date of the surrender of the city to the American forces, including the period of the insurrection. During this time the Department was operated mainly by the army, with the aid of some natives, some of whom are still in the organization, having remained loyal to the city during the troubles that followed the insurrection. During the control of the Department by the army, it was reorganized, to some extent at least. There was new machinery ordered, such as new apparatus and appli-

ances of an improved pattern, with American horses to draw the apparatus. This machinery, after some delay, has finally been placed in service and operated. There is not to-day a piece of the ancient machinery left for the inhabitants to admire, all of which has been disposed of mainly or placed in the scrap heap.

No greater revolution was ever seen in any civic department than that which has taken place in the Fire Department of Manila. In connection with the installation of the new apparatus, we also have a complete fire alarm system, which will be as perfect as anything of its kind in use. I am sure that it will render most efficient service in announcing to the department the outbreak of incipient fires. In connection with this system the police will also have a similar system, to be operated entirely for their own uses and purposes, but over which alarms can also be transmitted, or, in fact, any call which they may desire to send; which will tend very greatly to increase the efficiency of both departments. The



NEW HEADQUARTERS AND EQUIPMENT, MANILA FIRE DEPARTMENT

entire city and many of the suburban districts will be covered by this system, and which will permit of an extension, in the future, to any distance that may be warranted by the growth of the city.

So great a reform in a system, or want of system, could not be accomplished in a moment. The transformation of the Fire Department has taken some little time to complete and perfect, as it entails a vast amount of labor and attention to details in connection with the substitution of the new apparatus for the ancient machinery which has heretofore been used to extinguish fires, and requiring in all instances the remodeling and alteration of houses for their occupancy. When this work will have been finally completed, there is no doubt but the city of Manila will have a more efficient fire department, so far as men, apparatus and machines are concerned, than exists in any other city in the East, and one which will equal, if not excel those of many cities of equal population in the United States. There are, however, still a few additions which we expect to make before we can say conscientiously that the city is thoroughly protected against fire. The most important of these are:

First: Additional water supply, requiring large distributing mains, with post hydrants attached, for the use of our engines; and, second, a fire boat of great capacity for discharging water for the protection of vessels in the river, harbor and bay in the vicinity of this city.

These additions are really a necessity; and I shall not consider the department thoroughly complete until such time as additional water can be supplied, and until a fire boat is constantly patrolling the harbor and bay of Manila.

The Fire Department of Manila, as organized at the present time, consists of:

San Nicolas Station: Engine Company No. 1—One Metropolitan steam fire engine, a hose wagon, and a chemical engine; Hook and Ladder Company No. 1—One ladder truck.

Santa Cruz Fire Station: Engine Company No. 2—One steam fire engine (Metropolitan), one hose wagon, one supply cart, a chief's buggy, a deputy chief's buggy, and one chief's cart.

Paco Fire Station: Engine Company No. 3—One steam fire engine (Metropolitan engine), capacity 400 gallons per minute, one hose wagon, a supply cart; Chemical Engine Company No. 3—One chemical engine.

Tanduay Fire Station: Engine 5 (Metropolitan) and hose wagon; Hook and Ladder Company No. 2—One hook

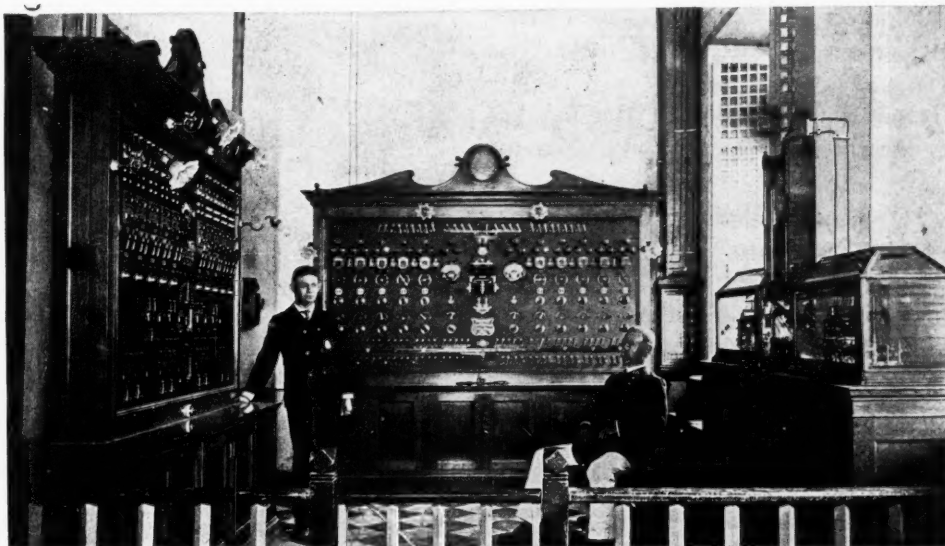
and ladder truck; Chemical Company No. 2—One chemical engine.

The department is in command of Chief L. H. Dingman, a native of Sault Ste. Marie, Mich. A member with volunteer fire department of that place for about two years. In 1886 left Michigan for the Pacific Coast and settled in Los Angeles, Cal. Found employment there and learned the tinning and plumbing trade. Worked seven years at his trade for one firm. Employed over three years as fireman for the Southern Pacific Railroad Company. Enlisted in Battery D, Cal. Volunteer Artillery, in 1898, and went to the Philippines. Enlisted as private in the Thirty-sixth U. S. Vol. Infantry, and was discharged January 23, 1901, as regimental Q. M. Sergt. Entered the Manila Police Department when it was organized and was transferred to the Fire Department as captain when it was reorganized in 1901. Appointed by the Municipal Board as Acting Chief of the Department after Chief Bonner's retirement.

The other department officers are: Deputy Chief, John Hoey; company captains, William J. Cuff, F. R. Stuart, J.

F. Smith, William Doyler, Robert J. Black, William Wolfert, Geo. L. Johnson, C. H. Lillie and C. F. Samuelsen, all of the United States; city electrician, Frank Moffett.

In this somewhat cursory résumé of the fire-fighting conditions at present existing at Manila, I have not dwelt upon the romantic, the geographical or the



GAMEWILL FIRE ALARM TELEGRAPH SYSTEM, MANILA FIRE DEPARTMENT

racial aspects of the subject. It is something to be proud of that Americans have been enabled to evolve a scientific and up to date fire fighting equipment that compares favorably with many of our own highly civilized centers, and this in a tropical country thousands of miles from our coast. The character and antecedents of the inhabitants must also be taken into account while we are looking over the equation. Climate and race have much to do with the characteristics of human beings, and it is greatly to the credit of the Filipinos that they have thrown aside their natural indolence and joined heartily with us in our efforts to improve the facilities for fighting fire in the city of Manila. It is the more remarkable in that a population who have hitherto lived in houses so light and flimsy in construction as to be of very small intrinsic value, should be so soon brought to realize the value of property under improved conditions and the necessity of strenuous efforts to preserve and protect such property. It augurs well for our future relations with the inhabitants of the islands. Mutual respect characterizes the relations between native and American firemen.

Fire and Police Personals

—John McConlogue was recently elected Fire Chief of Benicia, Cal.

—Captain Young, of Bristol, Pa., has been elected Chief of the Fire Department.

—Fire Chief Haney, of Jacksonville, Fla., is having a tower erected for drilling purposes.

—E. A. O'Donnell, of Cranford, N. J., has been elected Fire Chief, succeeding A. H. Miller.

—Fire Chief Coburn, of Harrison, N. J., was recently presented with a gold watch by members of his command.

—The annual inspection of the Fire Department of Reading, Pa., took place on Labor Day, with Chief Miller in command.

—Fire Chief Frank McCoy has been removed by Mayor Pierce, of Belleville, Ill., for indulging in improper criticism of public officials.

—Chief of Police Conrad Yaeckel, of Belleville, Ill., has resigned his position, owing to a misunderstanding with the City Council.

—Elizabeth, N. J., Volunteer Association presented President Swartz with a trumpet which he carried in the New Brunswick parade.

—John Campion, formerly First Assistant Marshal, has been appointed Fire Marshal of Chicago, vice Marshal Musham, resigned.

—Chief John P. Quigley, of the Syracuse Fire Department, has been elected president of the New York State Association of Fire Chiefs.

—The annual firemen's parade took place in Hackensack, N. J., September 4, with numerous visiting companies. Chief T. M. Spencer was in command.

—Milton Begley, of Monocacy Hose, has been promoted to Assistant Fire Chief of Bethlehem, Pa., for the recently annexed district of West Bethlehem.

—Police Chief Janssen, of Milwaukee, recently appeared before the Council and made an eloquent and successful protest against malicious attacks on his character.

—Secretary Frank H. Koesters, of the Omaha Veterans, visited the World's Fair on his wedding tour. He saw the National tournament and says it was a grand success.

—Alexander Wallace was appointed Superintendent of Police of Pittsburg, Pa., on September 28. The new chief is a personal friend of Pittsburg's chief magistrate, Mayor Hays.

—Fire Chief R. F. Brown, of San Jose, Cal., was tried on charges on September 12, and found guilty of dereliction of duty and dismissed from his position as head of the fire department.

—At Buffalo, N. Y., Battalion Chiefs Dill, Moest and Schau have been kept out of their salary for three months all on account of politics. Political fire commissioners are at the root of the trouble.

—After twenty years of police work in Hartford, Conn., William F. Gunn was appointed Chief of Police of that city on September 27. Chief Gunn succeeds former Chief Cornelius Ryan, who resigned.

—The first annual firemen's tournament for Oklahoma

and Indian Territory were held in that city on October 8 and 9. Oklahoma City Chief Mark Kessler was formerly captain of Engine 2, Kansas City, Mo.

—Miss Aurilla Wagner, of Denver, Col., sued Assistant Chief John Dulmage for \$3,000 for injuries alleged to have been sustained by her as the result of being run into by the Chief's buggy as he was going to a fire, January 5.

—Chief Henry Wimberg, of Egg Harbor, N. J., celebrated his twenty-fifth anniversary as a fireman September 27. Over 200 attended the celebration in Krein's Hall. At the banquet the Chief was presented with a gold watch.

—Stuart F. Dey, chief of the Geneva, N. Y., fire department since 1896, resigned his position on September 30, and John Murray, assistant chief, was appointed in his place. Chief Dey, who enjoys the confidence of the administration, resigned in order to give his entire attention to his private affairs.

—Chief of Police William L. Campbell, of Schenectady, N. Y., died suddenly of neuralgia of the heart in his home city on September 15. Chief Campbell was one of the oldest chiefs in point of service in the United States, having served as chief for a period of thirty-three years. In his early life he was a landscape gardener.

—Chief of Police R. N. Westbrook, of Albany, Ga., was the guest of honor recently at a barbecue tendered him by his friends. The affair proved to be a sort of love feast. Since the conclusion of the officer's trial before the Board of Police Commissioners he has been busy receiving the congratulations of his friends. It is true that the Commission imposed a fine of \$50 upon the Chief, but none of the more serious charges were sustained, and the Chief's friends consider the verdict a vindication.

CHIEF ENGINEER I. T. CLOUGH, of the Belfast, Maine, Fire Department, points out in his last annual report that the apparatus owned by the Department consists of two hand tubs in good working order, three hose reels, one hose pump, two hook and ladder trucks, one on wheels and one on runners. Three street fire boxes and 500 feet of hose has been added during the last year. Chief Clough recommends the purchase of more hose and fire boxes.

—As a token of the high esteem in which A. J. McArthur, founder of the Gainesville, Fla., fire department, and ever since its chief, for years a member of the City Council, is held, the Board of Trade convened in special session on September 27, and adopted a set of complimentary resolutions. The resolutions expressed regret at his resignation as chief and the fact that he was leaving the city. Later Mayor Thomas presented him with a handsome gold watch and chain on behalf of the department and the citizens.

—Samuel P. Wilson, of Peabody, Mass., died September 29, at the age of eighty-one years. He was a native of that town and for many years followed the trade of shoemaking. Then he became a policeman and was chief of the police force a number of years. He was baggagemaster of the old Eastern road at the local station, and on leaving that place was appointed town weigher, an office which he held until about two years ago. He married Miss Asenath Bruce, of Maine, in 1848, by whom he had six sons, two of whom are now living.

LITERATURE ON MUNICIPAL TOPICS*

Reviews of Some Important Books—What the Magazines and Reviews Have to Say About Civic Affairs—Municipal Reports Received

Books

In "The Dutch Founding of New York," Mr. Thomas A. Janvier approaches the subject with the penchant for accuracy of the true historian, while at the same time he does not allow it to detract from the graces of his literary style or cause it to eliminate the traces of romanticism which must appear in all historical chronicles indited by a man of imagination.

Mr. Janvier takes Washington Irving to task for having misled us all these years. "Artful fiction," he says, "being more convincing than artless fact, it is not likely that the highly untruthful impression of the Dutch Colonists of Manhattan given by Washington Irving ever will be effaced. Very subtly mendacious is Irving's delightful *History of New York from the Beginning of the World to the End of the Dutch Dynasty*. Bearing in mind the time when he wrote—while the records of the city and State still were in confusion—his general truth to the letter is surprising. But precisely because of his truth to the letter are his readers misled by his untruth to the spirit." The author thinks Irving's fancy undoubtedly kindlier than the plain truth. As he views them the Dutch were a rough lot, if not a bad lot, and they did not, he says—the phrase is from our own frontier vocabulary—come here for their health. Mr. Janvier informs us that, on February 2, 1653, the civic government was established in New York, which, in one form or another, has been maintained until the present day. He shows that "graft" was by no means unknown to New York's Dutch forebears. Sturdy old Peter Stuyvesant was not only a "grafter" but a "boss" who "made out his 'slate,' and then—with a directness that a Tammany leader would weep over in envy—put in his men by the simple process of issuing a proclamation in which they were assigned to their several offices." Philologists, says the author, will perceive with pleasure the nice linguistic propriety that there is in our present use of the Dutch word "boss." The instant New York became a city the political meaning of that word, in effect, was established and defined. It is somewhat startling to encounter the author's views somewhat later on, "That the morals," he says, "of New Amsterdam did not improve under English rule is not surprising—because New Amsterdam had no morals." Cloth, Morocco back, Tooled, pp., 218, \$2.50 net.

The Purification of Sewage, by Sidney Barwise, M. D. Second edition, revised and enlarged. D. VanNostrand Co., New York, 1904. Price, \$3.50.

As stated in the preface, the progress that has been made during the past few years in the biological treatment of sewage, has necessitated the reuniting and enlargement of the first edition of the author's book on the purification of

sewage, which was written in 1898. In its present form it is a handsome volume of 220 pages, which deals mainly with the principles and instructive details of the so-called bacterial treatment, although it also contains a good résumé of the various chemical and land treatments. The experimental work done in England is well described and illustrated, and some space is also devoted to the work done in this direction by the Massachusetts State Board of Health, but no mention is made of the careful investigations which have been in progress since 1897 in Hamburg, and since 1898 in Berlin. While the results of these experimental studies of the subject in Germany are not materially different from those reached in England and America, they are nevertheless worthy of notice, and a review of them by an expert like Dr. Barwise would certainly be read with deep interest.

Like most books on the treatment of Sewage, the volume under consideration touches very lightly and only incidentally on one of the principal troubles associated with sewage purification, namely, the pollution of the atmosphere in the vicinity of the works by the odors arising from the liquid in the course of its treatment. It is commonly stated that fresh sewage is nearly odorless, but the air which is found in the sewers of most cities is decidedly unpleasant, and is presumably contaminated by emanations from the liquid; hence it is also reasonable to presume that when this liquid is stored in a tank of sufficient size to hold the entire flow during from twelve to twenty-four hours, the air in contact with the sewage will likewise become tainted. Usually, this subject is dismissed with the remark that sewage works should be located at a considerable distance from habitations; but it seems to the writer that the matter of atmospheric pollution is of as much practical consequence as the defilement of a stream, and hence that in a work on sewage treatment, some space would be given to the consideration of odors and the methods of their treatment.

In other respects, Dr. Barwise's book is a valuable addition to the literature of sewage purification, and will be found very useful by those who have to deal with the subject in a practical way. It contains many excellent illustrations and diagrams, as well as an appendix on the analysis of Sewage and Sewage Effluents, in which the apparatus, reagents and methods in common use are well described.

Self-Propelled Vehicles, which comes in the form of a new edition, is a practical treatise, with illustrations, by J. E. Homans, A. M., which has been revised and in large part rewritten.

There is a large amount of useful information in the work, and it is so well arranged and clearly stated that the reader cannot fail to find the information given.

With regard to automobiles the author points out that types formerly prevalent are gradually lapsing in popularity

* Any book or periodical reviewed or mentioned in THE MUNICIPAL JOURNAL or elsewhere, will be sent to any address on receipt of price.

while others are gaining in corresponding ratio. Thus, steam carriages, which a few years since were manufactured by nearly two-score different concerns in this country, are at present built by scarcely half that number, and are sold in very small numbers. The electrical vehicle has taken its logical position as a means of freight and passenger traffic in cities and for short tours out of town; while the gasoline machine is rapidly gaining recognition as the automobile *par excellence*. Such changes in popular estimate of the three types of driving power are based almost entirely upon practical considerations, quite independent of the arguments that may be adduced by interested authorities and enthusiasts. 8 vo., pp. 672, bound in black vellum, gilt top, gold titles. Price, \$2.00.

The American Civic Association, of which J. Horace McFarland, of Harrisburg, Pa., is president, have sent out the first instalment of a series of leaflets which are to be continued in the future. Those received deal with the subjects of *Nuisances* and *Children's Gardens*. The latter subject is dealt with by Dick J. Crosby, of the Department of Agriculture. It is pointed out that among those who have seen it conducted by competent teachers, the school garden needs no advocate. Though of comparatively recent origin it has established itself firmly in the hearts of leading educators. The question of Nuisances is dealt with by Frederick Law Olmsted, Jr. He explains at length what a public nuisance is, and exactly what steps should be taken for its abatement.

The Report of the Commission on Additional Water Supply for the City of New York is a massive volume of 980 pages, which contains many maps, illustrations and tables. The report is the result of the work of Former Mayor Low's commission, which consisted of William H. Burr, chairman, Rudolph Hering and John R. Freeman. It was submitted to Robert Grier Monroe, former commissioner of Water Supply, and is sent out by the present commissioner, Mr. John T. Oakley.

The commission was employed about a year in investigating the question of additional water supply for the metropolis. Its investigations were confined wholly to New York water sheds, by advice, as inter-state sources of supply were not desirable for legal reasons. The Croton reservoirs being the sources of supply for Manhattan and the Bronx, it is important to note that it is the opinion of engineers that a dry season of less than two years would exhaust the supply.

The commission conducted its investigations into the Adirondacks and the mountain ranges south toward New York, and found that the Catskill range offered the best advantages for additional supply both in quality of water and cost. New York consumes daily about 500,000,000 gallons of water. Queens is in the greatest need of improved supply of any district in greater New York. The artificial filtration of all surface water is recommended for the Long Island boroughs. The investigations led along the line of estimating the amount of waste water lost daily.

The commission recommends meters, particularly in the case of large apartment houses. The average daily consump-

tion of water in New York is 100 gallons for each resident and visitor. The city is supplied by the gravity system, although there are eighty-two pumping stations in the greater city, with eighty-six pumps. It is found that typhoid fever is more prevalent in dry seasons, and that ground water in Long Island is almost entirely free from pollution. The Hudson river water above Poughkeepsie can be made palatable by filtration, but the commission is convinced of the superior quality of Catskill water. This district can furnish a storage capacity of 65,000,000,000 gallons. New York must obtain additional water supply within five years, and that period must elapse before provision can be made for the proper supply. Sand filtration is favored and one large aqueduct is preferred to two smaller ones.

The report has been prepared with accuracy and precision.

The Thirty-Second Annual Report of the Board of Trustees of the Fairmont Park Art Association (Philadelphia), contains the proceedings of the annual meeting of the association, including the formal presentation of Cyrus E. Dallin's statue of the "Medicine Man." The report also contains an interesting address, "Who was the Medicine Man," by Francis La Flesche, and an address on the "Historic Mansions of Fairmont Park," by Charles S. Keyser.

Articles in American Periodicals

The Desirability of Trail Cars in City Electric Railway Service, is an abstract of a report that was presented by M. G. Pavie, of Paris, at a meeting of the International Street Railway and Light Railway Association, held at Vienna. It is printed in the *Street Railway Journal*, New York City, September 17, 1904.

The Supervisory Control of Water Supplies in Great Britain, by James Robert Kaye, is a paper that was read at the Sanitary Institute, in Glasgow. It is published in *The Engineering Record*, New York, September 17, 1904.

The Saloon Within Patrol Limits, by Edward Patterson Sanford, is published in *The Outlook*, New York, August 27.

The September number of *World's Work*, New York, contains an article on "Golden Rule" Jones, by Brand Whitlock.

The Exposition as an Object Lesson to American Municipalities, is an article by Lenora Austin Hamlin, in *World To-Day*, New York, September, 1904.

Copper Sulphate Treatment of Lakes Clifton and Montebello, Baltimore Water Works, by Alfred M. Quick, President of Water Board, and Water Engineer, is published in *The Engineering Record*, New York, September 24, 1904.

The St. Louis Exposition, from the Standpoint of the Engineer, by William H. Bryan. It is interesting to note in this article the advance that power generation and electric applications have made since the Pan-American Exposition, held at Buffalo several years ago. It is the leading article in *The Engineering Magazine*, New York, October, 1904. Price, 25 cents.

In Protection Against Fires and Faulty Construction, by Louis Windmüller, the author makes a plea for the establishment of a society whose object it is to see that the building and navigation laws are not violated and thereby reducing the loss of life and property. This article is published in *The Forum*, New York, October-December, 1904. Price, 50 cents a copy, or \$2 per year.

The Annals of the American Academy of Political and Social Science, Philadelphia, September, 1904, contains two articles of special interest: *Street Railways in Philadelphia Since 1900*, by Thomas Conway, Jr., and *Public Ownership and Low Rates*, by Frank Parsons. Price, \$1 per copy.

In American Gas Light Journal, New York, October 10, 1904, Mr. Royal Shacklette, in his article on *Commercial Lighting*, tells of the troubles that gas companies have in getting the public to use the modern gas-arc lamp, and also to dispel the idea that gas is a secondary lighting material. In the same magazine is an article on *Acetylene from a Business Standpoint*, by Mr. Augustine Davis.

The University of Illinois, at Urbana, Ill., has issued a bulletin dated September 1, 1904, on *Tests of Reinforced Concrete Beams*, by Professor Arthur N. Talbot. This bulletin is the first one to be issued, and it will be followed by others that will be published by the University of Illinois Engineering Experiment Station.

Street Lighting is the title of a paper read by Mr. A. S. Hatch at the last meeting of the International Association of Municipal Electricians. Mr. Hatch advocates the use of the tower for lighting purposes, as it approaches the nearest to moonlight and enables the police to watch property better. Published in the *American Gas Light Journal*, New York, October 17, 1904.

The Proceedings of the Engineering Association of the South is the record of that society for the months of July, August and September, 1904. Published at Nashville, Tenn.; price, \$5 per annum.

Articles in Foreign Periodicals

Electricity from Water Power, by A. A. Campbell Swinton, is published in *The Engineering Times*, London, Eng., September 8, 1904. Price, 4 pence.

Recent Experience in Sewage and Sludge Disposal at the Saltley Outfall Works of the Birmingham, Tame and Rea District Board, by George A. Hart, is published in *The Public Health Engineer*, London, Eng., September 10, 1904. Price, 3 pence.

Notes on Reservoir Construction, by George Mitchell, is a paper read at the annual meeting of the Association of Municipal and County Engineers held at Shrewsbury, England. This paper is published in *Water*, London, Eng., September 15, 1904. Price, 6 pence.

Description of Refuse Destructor and Electrical Power Generating Station in Course of Erection at Saltley, by D. J. Roberts, is published in *The Surveyor and Municipal and County Engineer*, London, Eng., September 23, 1904. Price, 3 pence.

Various Methods for the Disposal of Refuse is the title of a paper read by Mr. James Murray at the recent annual con-

gress of the Sanitary Association of Scotland. Mr. Murray is the sanitary inspector of the County of Renfrew. The paper is published in *The Surveyor and Municipal and County Engineer*, London, Eng., September 30, 1904.

Sewage and Sewage Disposal Works, by Joseph Swarbrick, M. Inst. C. E., was read before the Incorporated Association of Municipal and County Engineers, at Withington, Manchester, in September. It is published in *The Engineering Times*, London, September 29, 1904. Price, 4 pence a copy.

The Municipal Journal, of London, September 30, 1904, contains as a leading article, *New York's Shallow Railway*. This article is a brief outline of the history of the New York subway from the time it was first thought of up to the present time, when it is nearing completion. It deals with the difficulties overcome and the amount of money it has taken to build it. Price, per copy, 1 penny.

The Municipal Works of Withington, by A. H. Mountain, Assoc. M. Inst. C. E. This article contains a description of the new sewerage system and sewage outfall works on the double-contact bacterial system. It is begun in *The Public Health Engineer*, London, October 1, 1904. Price, 3 pence per copy.

Standards of Ventilation, by J. S. Haldane, M. D., F. R. S. Dr. Haldane deals with the amount of air necessary for people to breathe under different conditions in order to keep in a healthy condition. *The Standardization of Methods for the Bacterioscopic Examination of Water* is the report of a committee appointed in 1903 to devise a scheme of uniform procedure in the bacterioscopic analysis of water. Both articles are in *Public Health*, London, October, 1904. Price, 18 pence.

Public Documents Received

Proceedings of the Association of the Board of Public Service of Ohio, 1903. Hon. John Stolberg, President.

Annual report of the Water Works Division of the Board of Public Service, of Cleveland, O., for 1903. Mr. Edward W. Bemis, Superintendent.

First annual message of Hon. John Weaver, Mayor of Philadelphia, Penna.

Thirty-ninth annual report of the Board of Water Commissioners, of Reading, Pa. Mr. George H. Felix, President.

The 1903 annual report of the State Engineer and Surveyor of New York. Mr. William Pierson Judson, Deputy State Engineer.

The thirty-second annual report of the Fairmount Park Art Association, of Philadelphia, Pa. Mr. John Converse, President.

The fifteenth annual report of the Board of Trade, of Springfield, Mass. Mr. Henry H. Bowman, President.

The tenth annual report of the Board of Health, of Montclair, N. J. Mr. Charles D. Thompson, President.

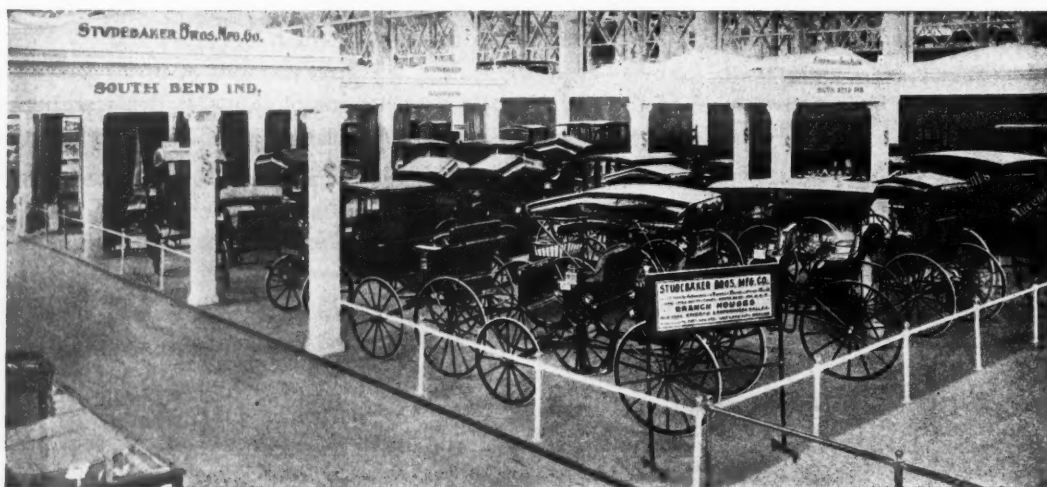
The fifteenth annual report of the Commissioner of Parks and Boulevards, of Detroit, Mich. Mr. R. E. Bolger, Commissioner.

The 1904 annual report of the Health Department of Louisville, Ky. Dr. M. K. Allen, Health Officer.

VEHICLE MAKERS FOR THE WORLD

THE bullock-wagon of Egypt, whose cumbersome wheels still crunch the sand of the roads along the Nile, is in one corner of the Palace of Transportation, at the World's Fair, and on the opposite side of the great stretch of floor, under a big American flag, is the Studebaker vehicle in its scores of forms. Thus, in a walk of two minutes, one can cover thirty centuries, and bear the greeting of the Sphinx to the Flag and all it stands for in industry and achievement.

These great Studebaker exhibits, covering nearly 10,000 square feet, are deeply impressive embodiments of the free industrial spirit of the country. Moreover, they are very interesting in themselves.



THE STUDEBAKER CARRIAGE EXHIBITS IN THE TRANSPORTATION BUILDING

But behind them loom the great factories at South Bend and the fifty-two years of cumulative growth, from a little blacksmith shop, with a yearly product of two wagons, to the place of conceded leadership in the vehicle industry of the world. This is progress that is typically American. It is the sort of progress that has changed the great valley of the Mississippi, in a century, from a wilderness into the mightiest industrial empire of the ages.

To have been a part of the last half-century in this wonderful transformation is the distinction of the Studebakers. That is their real exhibit—it is the country whose cities they have helped to build, whose farms and mines they have aided greatly in developing. Many of the prairie schooners that sailed across the plains in the fifties were Studebaker wagons. The roads into the far Northwest followed trails that had been broken by Studebakers. In the fat valleys of the Miami, the Illinois, the Missouri—all over the broad West, they bore the loads.

And when the farmer or the business man had reached the point where he wanted a carriage for his family, the Studebakers were ready to supply him, as they were later with an automobile. Their vehicles have come to be accepted in every part of the world as the standard of excellence. There are shown in their exhibits at the Fair types of seventy-five vehicles, such as broughams, victorias, depot-wagons, coupe rockaways, opera-buses, phaetons, top-buggies,

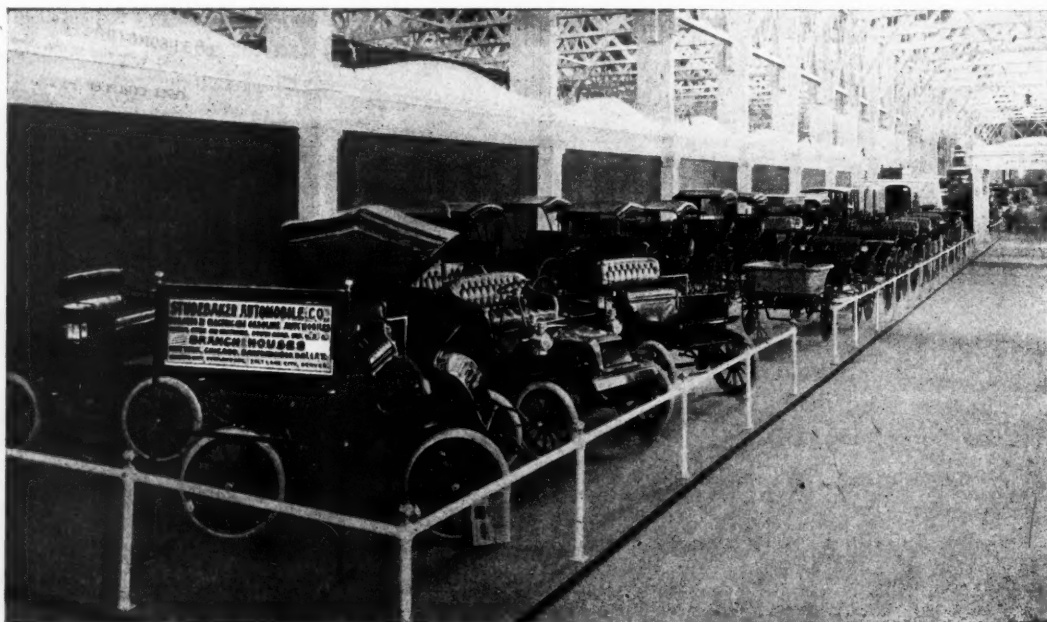
road-wagons, runabouts, extension and canopy-top surreys, electric and gasoline automobiles, farm-wagons, dump-wagons, coal-wagons, ice-wagons, express and truck-wagons, merchants' delivery-wagons, sheep-camp and mountain wagons; and there is, besides, a splendidly equipped harness and stable accessory department. This contains about one hundred sets, of different styles and grades, of four-in-hand, tandem, double and single brougham, double and single road-harness, surrey-harness, and, in fact, almost all kinds of harness for pleasure and teaming purposes. There is a line of riding-saddles shown which are made not only from an artistic point of view, but for comfort. In stable furnishings there are blankets, suits, brushes, whips, coachman-suits, lunch-baskets, dash-clocks, lamps, road-kits—in fact, the visitor will be amazed at the wide variety included in these great Studebaker exhibits.

This unfolding of a great industry, following a law of nature, is full of suggestion and hope. It shows the sufficiency of a business organization, if it have adaptability to adjust itself to changing conditions.

If the President of the United States, as President Roosevelt and others before him have done, wants a luxurious brougham, a victoria, a family carriage, or a vehicle of any kind,

harness or stable accessories, an order sent to the Studebakers at New York, Chicago, or at any one of their various repositories, will be instantly filled to the complete satisfaction of the customer.

In the second half-century, the Studebakers will keep in alignment with new conditions, but always from the solid foundation of the changeless principles that have been followed from the beginning. There will be progress, but it will be always the substantial kind. With abundant capital, with fixed principles, finding expressions in the highest standard of workmanship, the Studebaker Brothers Manufacturing Company may well hope to maintain their conceded position as the greatest vehicle manufacturers in the world.



THE AUTOMOBILE EXHIBITS OF THE STUDEBAKER AUTOMOBILE CO

Universal Steam Rollers at St. Louis

THE accompanying illustration shows four of the five Universal steam rollers owned by the Louisiana Purchase Exposition Company. Since the picture was taken a fifth roller has been bought and is now at work on the grounds. They have done the major part of the road building at the Fair. These rollers are not for exhibition purposes but were bought by the Exposition Company from the makers, Julian Scholl & Co., of 126 Liberty street, New York. The first roller bought performed its work so well that the others were bought in

supervision, however, for the plant was so thoroughly constructed no changes or alterations had to be made.

The Dixon Crematory Company which installed the plant has between 70 and 80 furnaces in operation. These are located at various points, extending from the Atlantic to the Pacific oceans. It has also installed plants for the United States Government in Porto Rico and Cuba. At the St. Louis Exposition it installed a furnace for exhibition purposes, but the managers proposed to pay the running expenses if the Dixon people would cremate all the refuse on the



FOUR UNIVERSAL ROLLERS PURCHASED BY WORLDS FAIR, ST. LOUIS, NOW IN USE ON THE GROUNDS.

rapid succession, the last one displacing a roller of another make. This is a fine endorsement of the merit of these machines.

These rollers have been constantly at work during the Exhibition season and have attracted favorable notice and comment from thousands of visitors. They are standard machines in every way.

Besides the five rollers on the grounds, the company has an exhibit in the Liberal Arts Building where they display three of the Universal rollers, a four ton, eight ton and twelve ton. The four ton is built with patent round edges, such as is used for special work on lawns, golf links, etc., where it is desired to keep the roll from cutting the turf. The eight ton roller is shown in position to run a portable stone crushing plant, the roller being belted to the crusher. This is one of the features possible in the Universal rollers. They can be used to drive a portable stone crushing plant or other machinery requiring power. In this case the roller is belted to a 9 x 16 Reliance crusher. The crusher is a portable machine, mounted on wheels. It is equipped with a 16-foot elevator which connects with a model stone bine, one of the regular 15 ton sizes mounted on wheels. The bin is equipped with a 9-foot rotary screen. It has three compartments for different sizes of stone and is also mounted on wheels so as to be easily portable. The rig, therefore, makes a comprehensive road building plant.

In addition to this portable stone crusher there is on exhibition a larger size Reliance crusher mounted for stationary work, also a five ton reversible horse roller and a Porcupine. The latter because of its novelty and utility has attracted a great deal of attention and comment from visitors.

Garbage Crematory at Charleroi

Charleroi, Pa., has scored another point in civic progress. The new garbage furnace is completed and in operation. It works like a charm, and takes in all the refuse offered it, which is consumed in short order. What is best of all, this is accomplished without odor or any offensive features.

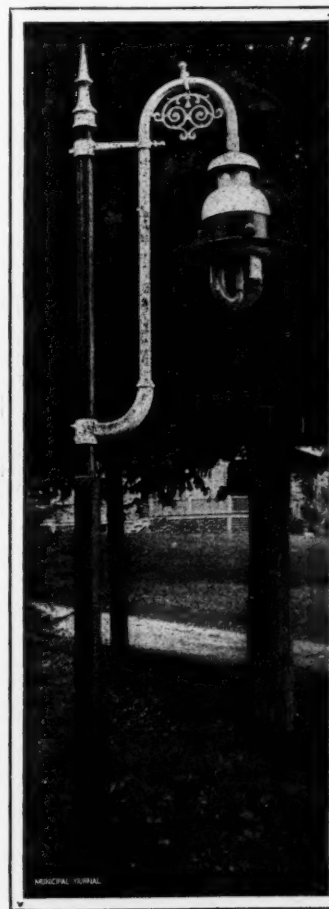
The new furnace was formally inspected by the city fathers, who are proud of their achievement for the betterment of the public service. F. K. Rhines, chief engineer of the Dixon Crematory Company, of Toledo, which erected the furnace, overlooked the plant for a period of 12 days, until its operations were thoroughly understood and everything in good working order. There was little need for his

grounds, which was accepted. The furnace is one of the best of its kind in existence.

A Graceful Automatic Lamp

THE Automatic Incandescent Light Company, whose factory is at Detroit, Mich., and whose adjusting department is at Northborough,

Mass., has recently perfected a new style fixture for their famous automatic outdoor lamp. The new fixture is designed primarily for driveway entrances and other spots where ornamentation is of importance. It is an extremely graceful and artistic lamp, and one that will add greatly to the chaste effect of an artistic driveway entrance. The new lamp will enhance the reputation of the company as makers of lamps that are as handsome as they are useful.



Trade Publications Received

The Federal Filtration System, William M. Deutsch, patentee, 141 Broadway, New York City, is comprehensively described and illustrated in a 12-page pamphlet. Plants are now being installed in the following cities and towns: Barnsville and Augusta, Ga.; Larchmont, Tarrytown and Stamford, N. Y.; Leavenworth, Kans., and Youngstown, O.

—The American Blower Company, 141 Broadway, New York City, with main office and works at Detroit, Mich., manufacture

the "A B C" heating, ventilating, drying, mechanical draft apparatus, etc. "A B C Vertical Engines, type A, catalogue No. 171, describes the new and effective system of automatic lubrication for vertical high speed engines. It is a clear presentation of the subject, which is likely to interest many of our readers.

—Dean Brothers Steam Pump Works, Indianapolis, Ind., have issued an attractive 56-page catalogue, fully illustrated, and printed in two colors. It is one of the booklets that interested city officials should have on file.

—The Studebaker World's Fair catalogue, which deals with the subject of vehicles, is an attractive 16-page folder, handsomely printed and illustrated. It contains a map of the grounds and a lot of useful information to World's Fair visitors.

—The Philadelphia Water Purification Company, 1700 North Twelfth street, Philadelphia, Pa., has issued a neat 28-page catalogue with a bright red cover gotten up in the best of taste. The description of the Hungerford-Elfreth filters of purifying water, which are manufactured by this company, is comprehensive and well illustrated. City officials who are interested in this subject will be glad to get in touch with this concern.

—"Standard Steel Omnibuses," is the title of a 64-page booklet recently issued by the Art Metal Construction Company, Jamestown, N. Y. This booklet tells about "buses" that carry books for vaults, offices and counting rooms, and not those for carrying people. It is a booklet that will be sure to interest the heads of all departments in city offices, and it can be had for the asking.

—In going from New York to Chicago the route to choose is that of the famous "20th Century Limited," which from Buffalo, runs over the tracks of the Lake Shore and Michigan Southern. When making the trip it should be borne in mind that you can secure the stop-over privilege at Niagara Falls and so visit the greatest water fall in the world. This and other privileges are fully explained in special folder entitled "Travel Privileges," by sending to A. J. Smith, G. P. & T. A., Cleveland, Ohio.

Rubber Tires on Fire Apparatus

At the recent convention of the Fire Chiefs at Chattanooga there was no accessory more talked of than rubber tires, and it was the consensus of opinion that the general adoption of rubber tires for fire apparatus was one of the most prominent improvements that had been added to fire fighting equipment during the past two or three years.

horses is much less and the liability of accident from skidding or over-turning is almost eliminated. There is also a marked increase in the speed to be attained in getting to a fire.

One of the largest departments in the country recently equipped some of their engine and coal wagons with rubber tires. Much to the surprise of the chief it was found that the engines would beat the hose wagons to the fire. This discovery has resulted in the determination to equip all of the apparatus with rubber.

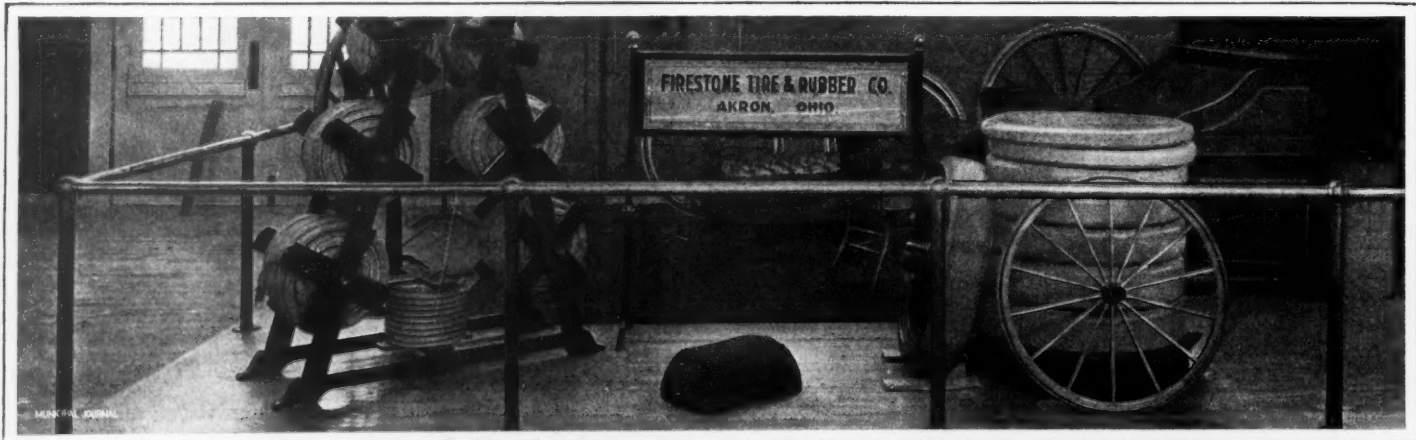
These advantages do not by any means cover all the claims made for the Firestone Tire, and chiefs who are not familiar with this tire will do well to investigate its merits and consider the advisability of equipping their apparatus before compiling their budget for the ensuing year.

The Firestone Tire & Rubber Company, whose advertisement appears on another page of this issue, has interesting literature bearing on this work, which they will gladly mail upon request.

Municipal Exhibits at the World's Fair

Among the interesting exhibits found on the model street, and in the various places of exhibition were Warren's bitulithic pavement, Purington's brick, asphalt laid by Barber Asphalt Paving Company, kreodone and creo-resinate wood block pavements and macadam road beds. There was a sectional view of New York's new subway, street cleaning exhibits, water and bridge systems and public building models. The city of San Francisco had a special exhibit in the San Francisco building, as did also the municipal museum constructed by the twin cities St. Paul and Minneapolis. New York and Kansas City also had city buildings, and there were special exhibits sent by Philadelphia, Buffalo and Boston. Hale's fire fighters on the pike attracted a good deal of attention, and really furnished as good a show as could be found in that portion of the fair.

In various parts of the Exposition were to be found attractive municipal exhibits, including the American La France Fire Engine Company, the Fire Extinguisher Manufacturing Company of Chicago, the Fire Dust Company of St. Louis, the Eureka Fire Hose Company of New York, the Driggs Fire Extinguisher Company of New York, the A. P. Smith Manufacturing Company of Newark, the Western Fire Appliance Company of Indianapolis, the Missouri Lamp & Manufacturing Company of St. Louis, the General Fire Extinguisher Company of Providence, R. I., the Meneely Bell Company of Troy, N. Y., the Stempel Fire Extinguisher Company of St. Louis. Water meters



Previous to the time mentioned rubber tires have been tried, but owing to their construction did not prove all that could be desired as the tire cut out at the base and was not held sufficiently firm in the channel to withstand the severe strain required.

The Firestone Tire & Rubber Company, of Akron, Ohio, gave special study to fire department requirements and as a result their Side-Wire Tire was placed upon the market. In practical service this tire proved to be all that was required. The method of fastening holds it absolutely solid in the channel, it cannot cut out through the base, it cannot roll when swinging corners, will go in and out of car tracks without difficulty.

It is claimed by different chiefs that the tire will pay for itself within one year by the saving of repairs. The draught upon the

were represented by the National Water Meter Company, the Pittsburgh Meter Company, the Neptune Water Company, the Thompson Meter Company, and the Hersey Meter Company. The Art Metal Construction Company of Jamestown, N. Y., had an extensive and fine exhibit of office furnishings and appliances made in steel. The American Street Flushing Machine Company of St. Louis, the St. Louis Street Flushing Machine Company and the Sanitary Street Cleaning and Sprinkling Machine Company had attractive exhibits among the street cleaning appliances. The Kelly-Springfield Road Roller Company of Springfield, Ohio, the Consolidated Car Fender Company of New York, the Maguire Manufacturing Company of Chicago, the Allis-Chalmers Company and the Westinghouse Electrical exhibits were all of general interest to municipal officials.

Items of Interest About the Trade

—The C. O. Bartlett & Snow Co., Cleveland, Ohio, reports recent sales, as follows: One steam dryer to Buckeye Reduction Co., Findlay, Ohio; one to S. Mendelson, Elyria, Ohio; one to Binns-Stucco Retarder Co., Urichsville, Ohio; one belt conveyor and other machinery to Daniel H. Grandon, Jamestown, N. Y.; elevating and conveying machinery to Ohio Sand Co., Conneaut, Ohio; also to Crown Dryer Co., Cleveland, Ohio; one "Triumph" gravel excavator and digger to I. E. Boomer, Detroit, Mich.; four special paint machines with motor drives to Lowe Brothers, Dayton, Ohio; special grading machinery to Magallon Gold & Copper Co., Cooney, N. M.; coal elevating and conveying machinery to James W. Ellsworth & Co., Cleveland, Ohio.

—The Louisiana Purchase Exposition has conferred the highest award, a "Gold Medal," on the Pittsburg Meter Company, East Pittsburg, Pa., for the superior excellence of its "Keystone" water meters and "Westinghouse" gas meters. This concern was also awarded the "Gold Medal" at the Pan-American Exposition.

—Mr. T. Hugh Boorman, American agent of the Geo. M. Callender & Co., Ltd., has lately returned from a trip to England. While there he arranged for the manufacture of the Callender's material in this country. The necessary capital to carry on the enterprise was arranged for in England, but the engineer manager to take charge of the new business has not yet been appointed, as it has been decided that such manager must be an American civil engineer of recognized standing in the profession.

—The Eureka Fire Hose Co., New York, have been advised that their "Eureka," "Paragon" and "Red Cross" brands of seamless rubber-lined fire hose have been awarded the highest honors at the St. Louis World's Fair, a "Gold Medal." It was to be expected that the product of the Eureka Fire Hose Co. would receive such substantial compliment, as their fire hose is a recognized necessity in every fire department where reliability is considered paramount to every other consideration, at the time of great conflagrations.

—The Eureka Fire Hose Co., New York City, desire us to head off a canard that is going the rounds of rumor mongers relative to a change in the agency of the company at Chicago, and to state that Messrs. W. H. Salisbury & Co., who have handled the product of the Eureka for so many years with marked success, will continue to be their only representatives at Chicago, and it is furthermore hoped they will remain indefinitely in control, thus adding to a long term of service that has been characterized by the highest degree of business tact and integrity.

—Mr. Arthur A. Adler, representing the American Road Roller Company, 156 Fifth avenue, New York City, was in attendance at the meetings of the American Society of Municipal Improvements at St. Louis, Mo., and the League of American Municipalities, East St. Louis, Ill.

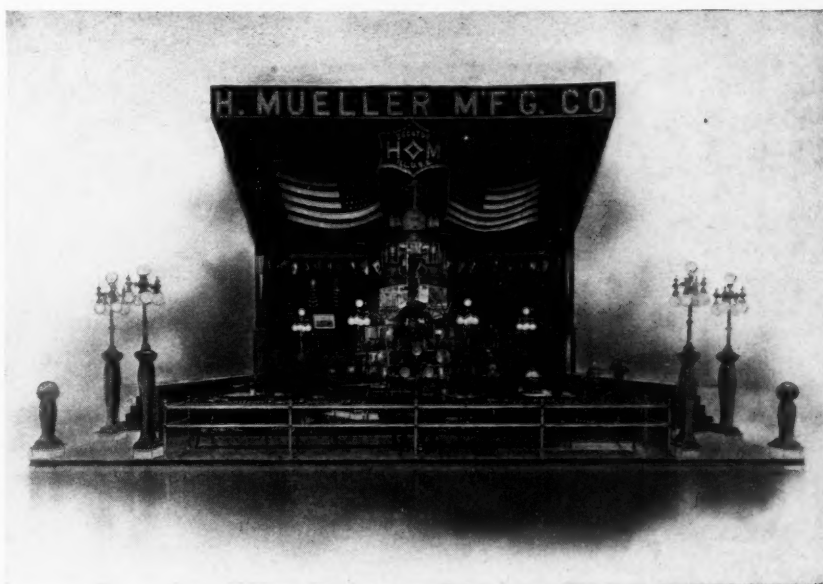
* * * A comparison between the stationary and portable stone crushers for streets in New Bedford, Mass., shows that in the stationary crushers the average cost of stone was 53.43 cents per ton; average cost of crushing, 26.87, making a total of 80.30 cents per ton. In the portable crusher the average cost of stone was 64.42 cents per ton; average cost of crushing, 45.02, making a total of 109.44 cents per ton.

* * * The cost of operation and maintenance of road rollers in Lynn, Mass., has been \$1,971.77 and the earnings rated at \$12 per day have been \$4,294.25, leaving a good margin for interest on cost and for depreciation, and for idle months.

Mueller Exhibit at World's Fair

MUNICIPAL OFFICIALS and individuals engaged in the purveying of water on a large scale will be interested in the exhibit of the H. Mueller Mfg. Co., Decatur, Ill., at the St. Louis Exposition.

In this booth, which, by the way, is arranged in a manner to form in itself an object worth seeing, the company exhibits a large assortment of brass goods used in hydraulic supply and control. Principal among these are water pressure regulators, tapping machines, corporation cocks, water connections, branch goose necks, curb cocks, stop and stop and waste cocks, sill cocks, check valves, pipe reamers, sand screens and strainers, and a miscellaneous assortment of pipe tools. The pressure regulators are shown in sizes from ½ to 20 inches, the former being used to control the pressure in houses and other buildings, and the latter to regulate the pressure in gravity systems where a heavy pressure must be reduced for domestic supply, or to regulate the main supply to any



district of the city or town. The tapping machines are clamped to a mounted pipe and operated by an attendant to show the method of making a tap under pressure without the escape of water. Besides being shown in an almost endless variety of patterns, the smaller articles, such as cocks, valves, etc., are shown in sectional parts, so that the method of their construction may be seen.

Besides the goods enumerated, there is an attractive display of goods used in plumbing construction, and city officials and water works men conversant and not conversant with the methods used for the final distribution of water can profit very materially from a study of the goods and their uses.

The exhibit is located on E street, between Fourth and Fifth streets, in the Palace of Manufacturers. Mr. Oscar B. Mueller, treasurer of the H. Mueller Mfg. Co., is in charge, and will be pleased to show the goods displayed and explain their uses to visitors.

* * * The general manager of State Fire Insurance in New Zealand anticipated commencing operations in September. It is claimed by the government that the private insurance companies doing business throughout the colony have, since the passing of the act to establish a State fire insurance department, greatly reduced their premiums, especially on properties in country districts.

* * * Mayor Maybury, of Detroit, Mich., has approved an ordinance to require street railway companies to equip cars with safety fenders. The penalty for non-observance is placed at \$50 fine, or imprisonment until the fine is paid.

CONTRACT NEWS FOR THE MONTH

Including Paving, Sewerage, Water Supply, Lighting, Public Buildings, Sewage and Garbage Disposal, Fire Supplies, Contracts Awarded

N. B.—All news of proposed work sent us by city officials is incorporated in our *Weekly Advance News Service* and appears subsequently in this "Contract News for the Month" if the date of the reception of bids be sufficiently late to warrant placing the item here.

City officials and others are urged to send us all news of contemplated improvements for use in our *Weekly Bulletins* which are mailed to those interested.

PAVING, PAVING MATERIALS AND MACHINERY

Akron, O.—\$36,900 street improvement bonds have been sold.

Albany, N. Y.—All bids for asphaltting South Pearl street have been rejected and new ones will be called for.

Baltimore, Md.—Will pave Ridgley, Franklin streets and Eastern avenue with asphalt blocks, at an estimated cost of \$87,000; Park avenue, vitrified brick, \$10,700; will pave Glover street and may asphalt Franklin street, \$6,000.

Birmingham, Ala.—Considering paving, with vitrified brick, 18th street and Morris avenue.

Buffalo, N. Y.—Will repave Michigan street with Medina stone, estimated at \$14,015, and Ferry street with asphalt, at \$13,227.

Camden, N. J.—Federal street will be paved with street asphaltum.

Celina, O.—Ordinance has been passed to issue \$22,000 bonds for paving Main street.

Cincinnati, O.—Will pave Highland avenue and Smith street with granite block and pave Cohoon, Olive streets and Gilmore avenue with brick.

Cleveland, O.—Will pave with brick West Fann lane, Mueller and Holton avenues and Adrian and Lorain streets.

Crawfordsville, Ind.—Will ask for bids for the construction of large amounts of concrete walk.

Davenport, Iowa.—Oak lane and Perry street will be paved with asphalt at once.

Des Moines, Iowa.—A mile and a half of Kingman avenue will be paved next year at an estimated cost of \$150,000. May curb Ingersoll avenue with cement.

Duquesne, Pa.—Considering spending \$80,000 on street improvements.

Easton, Pa.—Ordinance to issue \$25,000 paving bonds has been voted down.

Elliott, Pa.—Bids wanted for paving with brick, and curbing Lorenz avenue, estimated at \$30,000.

Escanaba, Mich.—It is reported that plans have been adopted for spending \$160,000 for street improvements.

Findlay, O.—Franklin avenue will be paved with vitrified brick at an estimated cost of \$5,516, and will also pave Washington avenue, estimated at \$14,000.

Houston, Tex.—Franklin avenue, in second ward, will be resurfaced at a cost of \$10,000.

Jersey City, N. J.—Grand street will be repaved and Claremont and Durnam avenues will be improved.

Grand Rapids, Mich.—Estimated cost of paving Ellsworth avenue is \$35,900; Grandville avenue, \$64,000; North Union street, \$14,750.

Ingram, Pa.—\$30,000 will be spent on grading, curbing and paving streets.

Kansas City, Mo.—Will pave Bank, Jefferson, Howard, Twenty-eighth, Thirty-second, Forty-third, Twenty-fourth, Nineteenth, Eleventh, Bellefontaine, McGee and Charlotte streets, Hammond place, Warnick boulevard and seven alleys. Will repair a number of streets, and are considering paving Myrtle and Walnut streets, Southwest boulevard and four alleys.

La Salle, Ill.—Contract for 12,000 square yards of brick paving will be awarded soon.

Lawrence, L. I., N. Y.—Vote will be taken on issuing \$10,000 bonds for grading and paving several streets.

Lorain, O.—Considering laying asphalt on Seventh and Eighth avenues.

Marion, O.—\$14,000 bonds will be issued in order to pave East Church street.

Meridian, Miss.—Twenty-second avenue will be asphalted.

Mt. Gilead, O.—Bids wanted soon for paving West High street with brick.

Newburg, O.—\$28,800 bonds will be sold on November 12, for street improvements.

New Iberia, La.—Bids wanted soon for 90,000 square feet of concrete walks, and 39,000 lineal feet of concrete curb. City Engineer.

New Orleans, La.—Will pave Poydras street with asphalt and granite block. Considering asphaltting Bienville avenue.

Newton, Mass.—Vote will be taken on issuing \$8,000 bonds for street improvements.

New York City, N. Y. (Brooklyn)—It is reported that \$300,000 have been appropriated for repairing Atlantic avenue.

Norfolk, Va.—Bonds will be sold for paving Brewer street, at \$7,825; widening Atlantic street, \$6,250; extending Granby street, \$18,312; improving Atlantic City street, \$20,000; other street improvements, \$43,000.

Pittsburg, Pa.—Marion avenue will be regraded and repaved.

Pleasant Ridge, O.—\$5,500 bonds will be sold on November 8, for street repaving.

Reading, Pa.—Parts of Greenwich, Reed, West Greenwich and Perry streets, and others will be paved and curbing will be laid.

Redwood City, Cal.—\$65,000 bonds have been voted for street improvements.

Rochester, N. Y.—Cement walks will be laid on Clinton avenue, Rodenbeck place, Hohenbeck, Francis, Norton, Ketcham streets, at an estimated cost of \$7,480. Rosedale street will be paved, estimated at \$5,700. May pave Pine and Mortimer streets. Considering laying Medina block on University avenue, estimated at \$47,000. Considering the laying of concrete walks in Raines park and Bradley street. May pave Wilkins street, \$22,000. Liberty street will be paved at an estimated cost of \$3,500.

Sacramento, Cal.—Estimated cost of work to be done on streets is \$30,000.

St. Louis, Mo.—Considering improving Ashland, Labadie, Saint Ferdinand, Carter, Ridge, Kentucky, Warne, Nebraska, Iowa, Hamilton, Burd, Belt and Grand avenues, and Algernon, Henrietta, Chestnut, Hebert, Eighteenth and Ferry streets and Forest Park boulevard.

St. Paul, Minn.—Considering spending \$10,440 on curbing and improving St. Anthony avenue.

Sandusky, O.—Hayes street will be paved at an estimated cost of \$27,000.

Seattle, Wash.—Concrete walks will be laid on Crockett street, Belmont place, Thirteenth and Fifth avenues, at \$33,150; Irving street, \$3,260, and East Lynn street, \$2,300.

Syracuse, N. Y.—Bids wanted for paving: South Geddes street, with asphalt or brick; Syracuse street; Montgomery street, with Trinidad asphalt; Norris avenue, with Syracuse brick; West Fayette street, with brick, estimated at \$14,300.

Thamesville, Ont.—\$6,500 will be spent in laying granolithic walks.

Troy, N. Y.—Considering resurfacing First and Second streets and paving Seventh avenue with asphalt.

Trenton, N. J.—Southart street will be paved with sheet asphaltum on a six-inch concrete base.

Watertown, N. Y.—\$10,000 is wanted for paving, next year, and \$20,000 for good roads.

Webb City, Mo.—Bids wanted on November 7 for 755 square yards of paving with vitrified brick on Church street, and 1,749 square yards on Webb street.

Wilkesburg, Pa.—\$50,000 bonds have been sold for street improvements.

Winnipeg, Can.—Will pave Wellington crescent with asphalt and lay granolithic walks on same.

Xenia, O.—Estimated cost of paving Main street is \$50,000.

Youngstown, O.—It is reported that \$12,000 bonds have been sold for paving Himrod avenue.

CONTRACTS AWARDED

Albany, N. Y.—Contracts to M. F. Dollard for paving with brick, Herkimer street at \$14,962.10, and Yates street, \$9,648, and to John Doyle, paving Division street with brick at \$11,773.56.

Alliance, O.—Contract for improving State street, reported to have been awarded to George D. Smith & Bro., Salem, at \$17,671.

Altoona, Pa.—Contract for brick paving on Sixteenth street, awarded to William H. Herr, at \$1.18 per square yard for 1,236 square yards.

Aurora, Ill.—Contract for brick pavement on Downer place, to J. E. Salfisburg & Co., at \$1.99 per square yard for 2,558 square yards.

Birmingham, Ala.—Contract for curbing gutters, pavements and walks, awarded to Jefferson Construction Co., at \$10,130.

Brookville, Ind.—Contract for sidewalk, curb and gutter improvements, awarded to Thomas Bridge's Sons, Wabash, Ind., at \$19,237.

Cincinnati, O.—Contract for paving Providence street with granite block, awarded to William Fogarty, 936 Windsor street, at \$11,393.

Columbus, O.—Paving contracts awarded: High street, at 30,212, to Cleveland Trinidad Paving Co., Cleveland; Broad street, \$8,463, to Blake Asphalt Maintenance Co.; Sixth street at \$6,824; Fourth street at \$1,768, Almond alley at \$1,618, Mt. Vernon avenue at \$2,887, Pennsylvania avenue at \$4,324, and Michigan avenue at \$4,552, to D. E. Sullivan & Son; Noble street at \$7,522, to Geigle & Ganes; Long street at \$2,156, to Buckeye Engineer & Construction Co.; Grant avenue at \$3,832, to F. J. Fischer; Innis avenue at \$22,862, to N. B. Abbott & Co., 85 North High street.

Elgin, Ill.—Contracts awarded for paving: Grove avenue, with asphalt, to Thomas J. Peter Co., 135 Adams street, Chicago, at \$20,750; Division street with brick, at \$5,275, and South State street with macadam, at \$8,675, to G. S. Van Duesen, Michigan City, Ind.

Elyria, O.—Contract for improving Middle avenue, to Barber Asphalt Co., at \$22,000.

Evansville, Ind.—Contract for 9,000 square yards of brick paving, at \$1.52 per square yard, awarded to Holler & May; 3,000 square yards of brick paving at \$1.50 per square yard, awarded to Bedford & Nugent.

Findlay, O.—Contracts awarded to C. B. Hall & Son: Improving Center street, at \$4,672; Court place and alley, \$4,768; West Lima street, \$6,267; Clinton court, \$4,491.

London, Ont., Can.—Contract for paving Queen's avenue with sheet asphalt, awarded to Barber Asphalt Co., Toronto, at \$20,888.

New York City (Brooklyn)—Contracts awarded: Moffat street, to Eastern Bermudez Asphalt Paving Co., 26 Court street, at \$13,461; Waverley avenue, to The Crawford Co., 52 Ninth street, at \$23,578; North Oxford street, at \$14,309, and Schenectady avenue, at \$28,029, to Brooklyn Alcatraz Asphalt Paving Co.; Clinton Place, \$25,736, Gates avenue, \$20,840, Marion street, \$26,216, Lorimer street, \$12,401, Douglas street, \$15,308, Franklin avenue, \$17,003, all to Uvalde Asphalt Paving Co., Broadway, New York City.

Painesville, O.—Contract for brick paving on St. Clair street, to C. H. Stocking, at \$14,930.

Peoria, Ill.—Contract for paving Smith street, awarded to A. D. Thompson, at \$16,959.

Rochester, N. Y.—Contract for paving Brozel street with brick, awarded to F. A. Brotsch, at \$4,242.50.

St. Louis, Mo.—Contract for brick pavement at United States Clothing depot, awarded to William R. Bush Construction Co., 1113 Holland Building, at \$9,242.

St. Paul, Minn.—Contract for asphalt paving Bates avenue, awarded to Barber Asphalt Paving Co., at \$25,209.09.

Saginaw, Mich.—Contract for paving Cherry street, awarded to Trinidad Paving Co., at \$8,070.

Seattle, Wash.—Contract for road to Rainier National park, awarded to A. D. Miller, city, at \$25,648. Contracts awarded: Concrete walks on Belmont place, to Hans Pederson, at \$2,444; concrete walks on Boren avenue, to Coast Concrete Co., at \$24,880.75; grading and concrete walks on Thirteenth avenue, to Frank & Brandon, at \$1,899.

Sharon, Pa.—Contract for State road in Hickory township, awarded to Booth & Flynn, Pittsburg, at \$35,000.

Sterling, Ill.—Contract for thirteen blocks of paving on West Fourth street and Avenue "B," awarded to Timothy O'Rourke, city, at \$33,008.

Sullivan, Ill.—Contract for paving East Harrison, Worth and Jackson streets, reported to have been awarded to M. E. Case & Co., Peoria, Ill., at \$37,186.

Syracuse, N. Y.—Contracts awarded: Paving Norris avenue, with brick, to John W. Bustin, at \$5,355.93; paving East Jefferson street, with Trinidad asphalt, to Warner-Quinlan Asphalt Co., at \$8,707.31; paving Wyoming street, with Nelsonville block, to F. J. Baker, at \$3,603.25.

Tacoma, Wash.—Contract for cement walks on "G" street and Tacoma avenue, at \$22,870, and also in district 219—Division avenue and "I" street, at \$23,970, awarded to McHugh & Kibler, Seattle.

Toledo, O.—Contract for paving Collingwood and Detroit avenues with 5-inch Manhattan blocks on concrete, awarded to Russell & Jennison, at \$12,708.10.

Xenia, O.—Contract for paving Detroit street with brick, awarded to R. H. Fleming, Ludlow, Ky., at \$65,000.

SEWERS

Alliance, O.—\$21,000 bond issue has been authorized by council for storm-water sewers.

Amarillo, Tex.—\$45,000 bonds have been voted for a sewerage system.

Baltimore, Md.—Considering the appropriation of \$44,450 for sewer extension on Wolfe street.

Camden, N. J.—Sewer extensions will be laid on 10th, Mechanic, Grant and 8th streets.

Cincinnati, O.—Will sewer Coleraine, Mistletoe and Espanola streets and Eastern, Columbia and Academy avenues. The estimates for the three avenues are: 544 lineal feet of 3-foot brick sewer; 3,785 feet 12-inch, 1,310 feet 15-inch, 1,593 feet 18-inch, 500 feet 21-inch and 600 feet 24-inch pipe sewers; 51 Palmer inlets; 16 round manholes; 43 oval manholes; 3 manholes; 40 6-inch slants for brick sewer; 68 Ys on 12", 28 Ys on 18", 18 Ys on 21" and 32 Ys on 24" sewers.

Cleveland, O.—Will extend sewers on Bazetta, Leroy, Haddock, W. Jackson, Shephard, Bruce, Colorado, Eichhorn, Freeman, Garfield, Jirousek, Praha, Ellen, Quincy, Kershaw, Cyril, Dalon, Reade, Trenton, Covert, Grape and Metta streets, and North Duncan, Ansel, Dennison and South Willson avenues and Morris place. Will grade and lay sewers in Highland Park cemetery to the extent of \$25,000.

Dayton, O.—Will lay storm-water sewer extension on Horton street, estimated at \$4,000.

Davenport, Iowa.—Plans will be made for sewer extension for northern part of city; 17,660 feet estimated, to cost \$50,000.

Elberton, Ga.—Vote will be taken on November 10 on the issuance of \$20,000 bonds for a sewerage system.

Faulton, S. Dak.—\$6,000 bonds were recently voted for sewer extensions.

Greenville, S. C.—Will extend sewer on Washington street for 3,835 feet, estimated at \$3,000.

Hancock, Mich.—It is rumored that city will award contract for sewer system for West Hancock, estimated at \$28,000.

Harrisburg, Pa.—Sewer system will be improved to the extent of \$365,000.

Houston, Tex.—Considering issuing \$42,000 sewer extension bonds for sewers in Third and Fourth wards.

Hudson, Mass.—Recently voted to issue \$50,000 sewer system bonds, in addition to \$100,000 previously appropriated.

Indianapolis, Ind.—Will extend sewers in southern part of city for 22,990 feet. Sewers will vary from 5 feet to 8 inches in diameter.

Jacksonville, Fla.—Bids wanted soon for 428 feet of 36-inch, 236 feet of 30-inch, 3,622 feet of 24-inch brick sewer and 1,269 feet of terra cotta sewer pipe.

Jersey City, N. J.—Plans have been drawn up and contract will be awarded this fall for a relief sewer for Jackson avenue district, estimated at \$160,000.

Lambertville, N. J.—Plans have been prepared for the installation of a sewer system.

Lawrence, Mass.—Considering laying 3,900 feet of sewer pipe, estimated at \$45,000, to drain Potter's Pond.

Middletown, O.—Sanitary and drainage sewers will be constructed.

Minneapolis, Minn.—Trunk sewer will be extended on 26th avenue.

Muscataine, Iowa.—Will spend \$11,310 on extension to Papoose Creek concrete sewer.

Philadelphia, Pa.—Plans have been approved for sewer extensions on Summerdale and Fisher avenues and Pratt, Grand, "A," Duncan-n, Ninth and Ashdale streets.

Portsmouth, Va.—It has been estimated that the Park View sewer extension will cost \$60,000.

Rochester, N. Y.—Will sewer Rutter street, and the estimated cost of sewer on Welden street is \$900, and St. Paul street, \$10,000. May sewer Robert, Federal and Cottage streets.

Sacramento, Cal.—It has been estimated that sewer extensions will cost \$20,000.

St. Joseph, Mo.—City engineer is preparing plans for the following sewer extensions: Blakesnake, estimated at \$60,000; Mitchel avenue, \$60,000; main sewer in South street, St. Joseph, \$75,000; Sycamore street, \$18,000; Grand avenue, \$30,000; Wyatt Park, \$10,000, and \$2,500 for other sewer work.

St. Louis, Mo.—\$9,000,000 bond issue ordinance has been passed, of which \$2,000,000 are for sewer extensions.

St. Paul, Minn.—The following are estimates for sewer extensions: Ohio street, \$46,400; Duke street, \$3,475; W. Delost street, \$22,610; Bacon street, \$1,775.

San Diego, Cal.—Specifications have been approved for sewer pipe, estimated at \$100,000.

San Francisco, Cal.—Will extend: 8-inch and 12-inch sewers on Park Hill avenue; 15-inch sewer on Tilden street, and 650 feet of 18-inch sewer on the same street. Will also extend sewers on Duboce and 23d streets.

Seattle, Wash.—Estimated cost of sewer extensions on South 24th avenue is \$5,350, and on Rainier avenue \$87,000 for trunk sewer.

Springfield, O.—Plans have been prepared for 120 miles of sewer extensions in 22 districts, and to include also a sewage disposal plant. Pipes will range from 8 inches to 36 inches in diameter. Estimated cost is \$350,000. City Engineer Sieverling.

Tampa, Fla.—Council has passed an ordinance to call election to vote on \$300,000 bond issuance, of which \$100,000 for sewers will be voted on on November 8.

Thomasville, Ga.—Vote will be taken on November 10 on issuing \$25,000 bonds for the extension of sewerage systems.

Troy, N. Y.—Estimate for Fifth ward sewer extension: main trunk sewer, including land, \$73,136; main trunk sewer and right of way, \$66,161; Albia system, \$36,225; Spring avenue system, \$15,435; tank, motors, engines, etc., \$11,150; force main, \$6,541; separating system of sewage, \$31,225; surface drainage, \$12,245; surface drainage into Spring avenue sewer, \$15,435.

Washington, D. C.—The following is an estimate of money to be spent on sewers for the fiscal year, of 1906: Cleaning and repairing sewers and basins, \$58,000; main and pipe sewer receiving basins, \$50,000; suburban sewers, \$50,000; completion of sewage disposal plant, at New Jersey avenue and "B" street, \$140,000; completing outfall sewer, \$310,000; completing lower section Rock Creek and "B" street intercepting sewer, \$29,000; completing Water and "L" street sewer, \$148,000; completing "4½" street intercepting sewer, \$80,000; completing "B" street sewer outfall, \$25,000; continuing

construction sewage pumping station, \$100,000; completing Arizona avenue trunk sewer, \$50,000; completing Ivy City sewer, \$50,000; other sewers, \$541,300.

Watertown, N. Y.—City wants to spend \$7,000 on sewer extensions next year.

Weatherford, Tex.—The recent vote to issue \$25,000 sewerage bonds was carried by a large majority, but on account of a technical error it was illegal and will have to vote again.

Winnipeg, Man., Can.—Estimates for sewer extensions on the following streets are: Cornish avenue, \$41,500; McGee street, \$1,485; Beverley street, \$7,416; Boyd avenue, \$4,085; Mulvey avenue, \$1,260.

Wyandotte, Mich.—Will install sewer system estimated at \$100,000.

CONTRACTS AWARDED (SEWERS).

Birmingham, Ala.—Let contract for sewers to Dunne & Lallande: 15,000 lineal feet of 10-inch pipe sewer, 9 to 12 feet deep, at \$2.50; 800 lineal feet 10-inch pipe sewer, 9 to 12 feet deep, at \$1.80; 650 lineal feet, 10-inch pipe sewer, 9 to 10 feet deep, at \$1; 120 yds. at \$1; 5 complete manholes at \$40.

Buffalo, N. Y.—Let sewer contracts as follows: South Park avenue, to Wm. Franklin, \$500; and Hillside avenue, \$630; Whitfield avenue, \$2,556.73, and Folger street, \$2,033.82, to Johnson & Munn; Clio avenue, to W. G. Smith, \$529.

Butte, Mont.—Contract for storm sewer on Covert street awarded to W. E. Walsh, at \$5,580.

Centralia, Ill.—Contract for 8,400 feet of outfall sewer, awarded to D. W. Norton & Co., Vincennes, Ind., at \$12,302.80.

Highland Park, Mich.—Contract for two sewer extensions in Gerald avenue district awarded to Whittaker & Sons, at \$8,303.

Little Rock, Ark.—Contract for new sewer extension awarded to J. F. Keiser, at \$11,000.

Philadelphia, Pa.—Contracts awarded: Extension of McKean street sewer, H. E. Ruch, \$30,000; Shunk street, D. Peoples, \$75,000; Frankford system on Wakeling street, \$75,000; branch of Indian Run sewer, \$12,000; Eastwick avenue, \$30,000; all to R. Higgins; 60th street, to McCormick & Co., \$25,000; Lucerne street, to J. McMenany, \$3,000.

Richmond, Ind.—Contract for sewer awarded to Wm. H. Riehling & Co., \$15,000.

Rochester, N. Y.—Contracts awarded: Avenue "A" sewer, H. B. Hooker & Sons, \$7,495; Barton street sewer, John Calvin, \$718.75.

St. Louis, Mo.—Contracts awarded: 9th street sewer to Buehler-Cooney Co., \$8,163; Glaise Creek District 4, McIntyre & Leese Construction Company, \$34,420.

St. Paul, Minn.—Contracts awarded: St. Anthony avenue and Milton street, at \$2,396; Earl street, at \$686; Woodbridge, Albemarle and Geranium streets, at \$12,896, all to Chris. Johnson; St. Clair street, \$1,295, to John Lind; West Water and Fillmore streets, at \$6,130, and Western avenue at \$1,380, to P. J. Ryan.

Seattle, Wash.—Contracts awarded: Bay View street sewer, at \$16,823.30, to Stirrat & Goetz; North 20th avenue, at \$2,689.20, to Bell & Price.

Springfield, Ill.—Contract for 4,000 feet of 5-foot brick sewer to Bretz & Irwin, city, at \$18,074.

Topeka, Kan.—Contract for Fifth ward sewer to Brooks & Gilmore, city, at \$57,339.39; 8-inch pipe, at 67 cents per lineal foot \$7,400.15; 10-inch pipe, 76 cents per lineal foot, \$2,815.80; 12-inch pipe, 81 cents per foot, \$3,862.89; 15-inch pipe, \$1 per foot, \$3,221; 18-inch pipe, \$1.18 per foot, \$912.14; 21-inch pipe, \$1.87 per foot, \$3,500.64; 24-inch pipe, \$2.20 per foot, \$1,436.60; 27-inch pipe, \$3.35 per foot, \$2,294.50; 30-inch brick pipe, \$2.75 per foot; \$1,375; 36-inch brick pipe, \$3.60 per foot, \$774; 45-inch brick pipe, \$4.29 per foot, \$14,294.28; 45-inch brick pipe—3 ring—\$7.80 per foot, \$897; 1-inch galvanized iron pipe, 20 cents per lineal foot, \$160; 3 flushing tanks, at \$61.05, \$185.15; 45 catch basins, at \$32.16 each, \$1,447.20; 72 manholes, at \$43.67 each, \$3,144.24; 21 inlets, at \$12.20 each, \$268.80; loose rock, at 75 cents cubic yard, \$922.50; solid rock, \$3.50 per cubic yard, \$7,997.50; 50 cubic yards of concrete, at \$5 each, \$250; 10,000 feet of timber, \$180.

Watertown, N. Y.—Contract for storm-water sewer in First and Second wards to C. C. Burns, at \$28,900.

PUBLIC BUILDINGS

Aurora, Ill.—Plans have been accepted for the erection of a new high school, estimated at \$50,000. West Side School Board.

Baltimore, Md.—Plans have been revised for fish and produce market for Center Market space, estimated to cost \$400,000.

Bellaire, Mich.—All bids for the construction of \$30,000 court-house, have been rejected, it is reported, and new ones will be asked for.

Buffalo, N. Y.—\$150,000 bonds will be issued for the erection of new schools.

Charleston, S. C.—Plans are being prepared for the proposed \$100,000 city hospital.

Chicago, Ill.—Plans have been prepared for school at Schubert, Monticello and Lawndale avenues, to have three stories and twenty-four rooms, estimated to cost \$170,000. Considering the erection of a manual training school, on the South Side, estimated to cost \$300,000.

Clay Center, Kan.—A \$40,000 high school building will be erected.

Cleveland, O.—Cleveland School of Art will erect a \$100,000 building. Architects, Habbell & Benes, Citizens' Building, city.

Columbia, Miss.—Will vote on November 8th on the erection of a court house, estimated to cost \$50,000.

Cumming, Ga.—Plans are being prepared for the erection of a court house, estimated at \$25,000.

Cynthiana, Ky.—Will vote on November 8 on a \$40,000 bond issue for school building.

Eatonton, Ga.—\$30,000 bonds have been voted for the erection of a court house for Putnam county.

Edna, Tex.—Jackson county may issue \$50,000 bonds for the construction of a court house.

Faulton, S. Dak.—Considering erecting a court house, estimated at \$50,000.

Gainesville, Tex.—Recently voted to issue \$25,000 bonds for a city hall.

Galena, Ill.—Plans wanted about November 10 for a \$95,000 high school, to be built of brick or stone.

Goshen, Ill.—County will spend \$50,000 for repairs on court house.

Greenwood, Miss.—Leflore county has adopted plans for a \$68,000 court house.

Homestead, Pa.—Plans are being prepared for the erection of a \$30,000 municipal building.

Ithaca, N. Y.—Will vote on bond issue of \$250,000 for joint county and city building. Preliminary plans have been approved.

Janesville, Wis.—All bids have been rejected for Garfield high school and new ones will be received.

Kansas City, Kan.—Plans have been approved for the enlargement of the city hall, estimated at \$18,000.

Kansas City, Mo.—Board of Public Works has recommended the erection of a two-story brick building, 80 by 140 feet, for water department, estimated to cost \$24,000.

La Salle, Ill.—Plans are being prepared for a new city hall, estimated at \$40,000.

Littleton, Col.—Plans have been completed for a school building, estimated at \$40,000.

Louisville, Ky.—Plans are being prepared for a \$25,000 field house and pergola. Board of Park Commissioners.

McKeesport, Pa.—\$200,000 will be spent on the erection of school buildings.

Magnolia, Ark.—May erect a court house for Columbia county, estimated to cost \$50,000.

Marlboro, Mass.—A \$25,000 armory will be erected.

Memphis, Tenn.—County will erect a court house, estimated to cost \$1,000,000.

Missoula, Mont.—Considering the erection of a \$100,000 court house. Chamber of Commerce.

Mobile, Ala.—On November 8 Mobile county will vote on issuing bonds for the erection of a jail.

Monroe, Mich.—Plans are being prepared for a new city hall.

Montclair, N. J.—Bids wanted soon for a \$70,000 school.

Morris, Ill.—Plans have been prepared for a \$10,000 addition to the Grundy County court house.

Newport, Ark.—County has appropriated \$12,000 for a jail.

New York City, N. Y.—Mayor has approved an order to issue \$18,000 bonds for comfort station to be placed in Madison square park. Armory Board will repair five armories at \$14,000; install lighting plant in Seventh Regiment armory, \$55,000; additions to Thirteenth Regiment armory, \$75,000; addition to Seventy-first Regiment armory, \$9,975.

New York City, N. Y. (New Brighton, S. I.)—Mayor McClellan has signed ordinance to issue \$250,000 bonds for additional construction and equipment for borough building.

Orange, N. J.—\$125,000 bonds will be issued for the erection of school buildings.

Ossining, N. Y.—Plans have been approved for the erection of a \$50,000 prison. State Superintendent of Prisons, Albany.

Port Arthur, Tex.—Plans are wanted for a three-story manual training high school, estimated at \$68,000.

Portland, Ore.—Considering the erection of a \$100,000 high school building on the East Side.

Purvis, Miss.—Lamar county considering the erection of a \$45,000 court house.

Rushville, Neb.—Plans have been drawn for a \$25,000 court house for Sheridan county.

St. Paul, Minn.—\$40,000 has been appropriated for a school on Hague avenue.

Santa Clara, Cal.—\$50,000 high school building bonds will be issued.

Scranton, Pa.—Plans are being prepared for remodeling and adding to the Lackawanna County court house, estimated to cost \$500,000. Bids wanted soon for this and possibly for an addition of a court room, estimated at \$120,000.

South Chicago, Ill.—Considering the erection of English high school at Eighty-ninth and Manistee streets, estimated to cost \$300,000.

South McAlester, I. T.—The \$150,000 bonds to be issued for school buildings will be spent for four ward and one central high school.

Springfield, Mass.—Plans have been adopted for a \$125,000 technical high school building and contract will be awarded soon.

Stamford, Conn.—Public Building Committee recommends the adoption of plans, prepared by N. C. Mellen, 27 West Thirtieth street, New York City, for new town hall, estimated at \$150,000.

Stockton, Cal.—Preliminary plans have been submitted for a \$145,000 city hall.

Ventnor, N. J.—\$15,000 have been appropriated for new city hall.

Waco, Tex.—\$59,000 bonds have been voted for school buildings.

Washington, D. C.—Plans have been prepared for school at Mount Pleasant, estimated to cost \$50,000.

Youngstown, O.—City will erect a \$100,000 city hall.

CONTRACTS AWARDED

Aberdeen, Miss.—Contract for jail, reported to have been let to Dobson & Bynum, Montgomery, Ala., at \$17,400.

Altoona, Pa.—Contract for high school building, awarded to P. W. Finn, city, at \$197,900.

Baltimore, Md.—Contract for conservatory at Patterson park, awarded to Lord & Burnham, at \$13,225.

Baraboo, Wis.—Contract for court house, awarded to Henry Ferge, Milwaukee, at \$41,983.

Edwardsville, Ill.—Contract for jail building, awarded to John Keller, Clay street, city, and Pauly Jail Co., St. Louis, Mo., at \$18,590.

Hattiesburg, Miss.—Contract for \$50,000 court house for Perry county, awarded to McGee & Garber, 109 President street, Jackson, Miss.

Hollywood, Cal.—Contract for high school building, awarded to E. Siskon, at \$48,950.

Leominster, Mass.—Contract for high school, awarded to William F. Dunn, at \$99,991.

Little Rock, Ark.—Contract for high school building, awarded to General Supply & Construction Co., Fort Worth, Tex., and New York City, at \$100,000.

Minden, La.—Contract for court house, awarded to M. T. Lewman & Co., Demopolis, Ala., at \$40,000.

Paducah, Ky.—Contract for market house, to George Katterjohn, at \$20,000.

Springfield, Mass.—Contract for White street school building, awarded to D. C. Shea, at \$36,985.

Sutton, W. Va.—Jail and sheriff's residence, contract awarded to Elliott & Winchell, at about \$25,000.

Taylor, Tex.—Contract for city hall, awarded to P. O. Langworthy, at \$21,000.

MISCELLANEOUS

Antigo, Wis.—County Clerk V. P. Rath wants plans and specifications and estimated cost of interior decorations, vault and light fixtures and furniture for court house being erected for Langlade county.

Baltimore, Md.—Wyman park will be enlarged.

Duquesne, Pa.—Considering the installation of a \$10,000 garbage crematory.

Harrisburg, Pa.—\$250,000 has been appropriated for the purchase of land for parks and equipping them.

Muncie, Ind.—Site has been selected for garbage crematory and plans are under way for its erection.

Natchitoches, La.—Plans are being prepared for a sewage disposal plant.

New York City, N. Y. (Brooklyn)—Considering the establishment of thirteen new parks at a cost of \$7,200,000.

Norfolk, Va.—\$11,200 bonds will be sold for Mahone Lake park.

Philadelphia, Pa.—Considering introducing an ordinance to appropriate \$3,000,000 for eliminating grade crossings.

Portland, Me.—Plans have been prepared by the Consolidated Electric Light Co. to lay the wires under ground.

Rochester, N. Y.—Bids will be wanted soon for \$80,000 subway at Union street. City will buy ten sprinkling carts.

Sacramento, Cal.—\$15,000 is the estimated cost of proposed garbage crematory. Estimate on I street park is \$28,000, and Twenty-eighth street park \$3,000.

St. Joseph, Mo.—\$10,000 has recently been appropriated to extend Wyatt park.

St. Louis, Mo.—Board of Public Improvements considering establishing garbage crematories in different parts of the city.

St. Paul, Minn.—Telephone company forced to lay wires under ground.

Syracuse, N. Y.—City will install voting machines.

San Francisco, Cal.—Board of Public Works considering the purchase of street sweepers.

Topeka, Kan.—W. L. Osborne has offered the city a garbage crematory at \$7,000.

Toronto, Ont., Can.—Street Commissioner Jones recommends the erection of two garbage crematories.

Washington, D. C.—Citizens' Northwest Suburban Association want \$100,000 for improvements to Rock Creek National park. The Isthmian Canal Commission wants bids for twelve hand garbage dump carts for street cleaners, and ten horse-dump carts.

FIRE DEPARTMENT SUPPLIES

Anderson, Ind.—Plans are being drawn for two fire engine houses.

Berkely, Cal.—Ashby Improvement Club wants new combination hose wagon and a dozen new spanners.

Beverly, Mass.—\$6,000 brick fire station will be erected in the First ward.

Bucyrus, O.—\$15,000 will be spent on the equipment of a fire department.

Cecil, O.—Bids wanted for a brick building to serve as town hall and fire-engine house. W. H. Wood, Clerk.

Cincinnati, O.—City has bought a site for fire-engine house at the corner of Columbia and Court streets. Will buy an automobile fire engine and also a large engine to be pulled by horses.

Columbus, O.—\$28,000 has been appropriated for fire stations for the South Side.

Dayton, O.—\$6,500 will be spent for fire alarm boxes, underground telephone and alarm system and a new truck.

Deloraine, Man., Can.—\$6,000 have been voted to purchase fire apparatus with.

Grand Forks, N. D.—Bids will be called for the purchase of a fire engine. Purchased site for fire-engine house.

Houston, Tex.—Considering issuing \$11,000 bonds for a fire engine station in the First ward.

Kansas City, Mo.—Plans have been completed for the erection of three fire stations, the one to be located at Thirty-first and Locust streets, estimated at \$8,000.

Milwaukee, Wis.—Fire engine house will be erected in the Sixteenth ward. Bids wanted in December for a fire boat, estimated to cost \$75,000.

Montclair, N. J.—New ladder company will use the truck of Company 1, and the latter will purchase a three-horse truck.

New York, N. Y.—Fire Commissioner has asked for \$375,000 with which to purchase three new fire boats.

Norfolk, Va.—\$2,500 bonds will be sold in order to make extensions on fire department buildings. \$1,500 has been appropriated to buy a chemical engine for the Seventh ward; a hose cart will also be purchased.

Omaha, Neb.—May vote to issue \$60,000 bonds for the erection of three fire stations.

Racine, Wis.—A \$20,000 fire engine house is under consideration for erection.

Sacramento, Cal.—\$56,278 is the estimated amount to be spent on fire department.

Shaunberg, Ill.—City will erect a combination town hall and fire engine house, and will purchase hook and ladder truck, hose, etc.

Sylvania, Ga.—Will buy 1,000 feet of fire hose, two reels, hook and ladder truck, etc.

Toronto, Ont.—Fire and Light Committee reports on proposed improvements: One fire boat, \$50,000; three 750-steam engines, \$16,500; five steam heaters, \$1,500; central office for fire alarm telegraph, \$35,000; renewing and changing alarm boxes to succession type, \$10,000; Wellington street station, \$100,000; Bathwest and Bloom street building, \$25,000; mains, valves, hydrants, etc., \$261,000; Rose avenue fire hall addition, \$10,000; engines and pumps, \$145,000; buildings, etc., \$60,000; gas main, \$5,000; engineering and contingencies, \$55,000. Total, \$774,000.

Triumph, Mich.—\$2,500 bonds will be sold at once for fire apparatus.

Tuscumbia, Ala.—Will buy a chemical engine.

Victor, N. Y.—Will purchase apparatus at once for newly formed fire department.

Washington, D. C.—Plans are being prepared for a fire boat.

Waterbury, Conn.—Plans have been accepted for the erection of an engine house on North Willow street.

Watertown, N. Y.—May spend \$81,000 next year, on new equipment for fire department.

CONTRACTS AWARDED

Camden, N. J.—Contract for fire house at Twelfth and Federal streets, awarded to William Severns, 527 Arch street, at \$12,049.

Detroit, Mich.—Contract for fire house, awarded to John Flinn, 40 Fort street, West, at about \$14,000.

Madison, Wis.—Contract for Fifth ward engine house, awarded to Peter Faber, at \$6,750.

Milwaukee, Wis.—Contract for Sixteenth ward fire engine house, awarded: Masonry, to F. W. Tuddey, at \$5,246; carpenter work, to C. A. Kleppe, at \$4,866.

Philadelphia, Pa.—Contract for fire house for truck number 1, in Fairmount avenue, awarded to H. B. Shoemaker & Co., at \$17,770.

SPECIAL BOND ELECTIONS TO BE HELD

Water.—On November 8 bond elections will be authorized as follows: Madisonville, Ky., \$20,000, W. C. Hopewell, City Clerk; Massillon, O., \$200,000, City Auditor; Oxford, Pa., \$20,000, J. Allen.

WATER SUPPLY

Akron, O.—Considering voting, on November 8, on bond issue for water works, as follows: 20,000,000-gallon supply reservoir, \$20,000; 10,000,000-gallon filter works, \$100,000; buildings, \$25,000; machinery, \$100,000; 800 horse power boilers, \$12,000; two 30 by 100 foot standpipes, \$35,000; 80 miles of mains, \$400,000; 5 miles 30-inch force mains, \$18,000.

Bishop, Cal.—\$29,000 bonds have been voted recently for water works.

Bishopville, S. C.—Bonds have been voted and surveys are being made for the installation of a water works.

Bowling Green, Ky.—Plans have been prepared for the installation of a 3,000,000-gallon pumping engine.

Brunswick, Mo.—Plans are being prepared for water works installation.

Cambridge, Mass.—Considering, again, the appropriation of \$246,000 for a new pipe line.

Cando, N. D.—Several wells will be drilled at an estimated expense of \$18,000.

Ceylon, Minn.—Will sell \$3,900 water works bonds.

Chicago, Ill.—Plans have been completed for the erection of a crib, 72 feet in diameter and 40 feet high, for the Lake View water works, estimated to cost \$75,000. Bids are wanted on November 17 for one vertical triple-expansion engine, with a capacity of 40,000,000 gallons for station at Springfield and Central Park avenues.

Cincinnati, O.—Plans are being prepared for new municipal pumping station on Pond Hill, estimated at \$25,000.

Clare, Mich.—Considering issuing \$14,750 bonds for water works.

Clarion, Iowa.—Bids will not be called for until the \$15,000 bonds, recently voted, are sold.

Clyde, O.—It is reported that \$8,400 bonds have been sold for water works.

Columbus, Ga.—Cost to install new water supply from Blue Springs estimated at \$549,735.

Columbus, O.—Water mains will be extended in all parts of the city. Bids are wanted on water pipes estimated at \$14,000.

Colville, Wash.—Site has been secured and vote may be taken in December on issuing \$15,000 bonds for a water works.

Crestline, O.—Contract will be awarded in December for improvements to water works, estimated at \$75,000.

Dallas, Tex.—Water commissioners want bids on three carloads of water pipe. City expects to spend \$20,000 in 1905-6 on water-main extensions.

Elyria, O.—Considering appropriating \$50,000 for power at pumping station.

Galveston, Tex.—May lay another water supply main across the bay, estimated at \$114,000. H. C. Lanze, Chairman, Water Works.

Guelph, Ont., Can.—Considering voting on issuing \$5,000 bonds for new filter.

Harrisburg, Pa.—A \$65,000 dam will be erected in the Susquehanna River and a filtration plant, estimated to cost \$310,000, will be constructed.

Howell, Neb.—Will vote soon on issuing \$8,000 water works bonds.

Kansas City, Kan.—Considering the installation of water works, estimated to cost \$1,500,000.

Laramie, Wyo.—It is reported that \$12,000 bonds have been voted for building a reservoir.

La Salle, Ill.—Will buy a 3,000,000-gallon pump. Water Works Commission.

Lebanon, Pa.—Vote will be taken on November 8 on issuing \$16,000 bonds for an additional pipe line to South Mountain supply dams.

Mayville, Wis.—Voted recently to issue \$37,000 water works bonds.

Meeker, Col.—\$60,000 bonds will be issued for the installation of a gravity water system.

Menasha, Wis.—\$75,000 bonds have been voted for building water works.

Minneapolis, Minn.—May vote on November 8 on issuing \$1,000,000 bonds for sand filtration plant.

Monrovia, Cal.—Considering bond issue for the following: Auxiliary pumping station, \$4,000; purchase of water meters, \$5,000; relaying and replacing pipe, \$3,000; improving reservoirs, \$6,000; machinery at water wells, \$10,000. Trustee Williams, Chairman Water Commission.

New Madrid, Mo.—\$12,000 bonds have been voted for the installation of water works.

Newton, Miss.—Vote will be taken on issuing \$9,000 bonds for a water works system.

New York City (Brooklyn).—Bids wanted for iron and brass pipe, fittings, valves, tools, etc. Bids wanted, November 23, for 700 4-nozzle post hydrants and 40 2-nozzle fireboat connection hydrants for high-pressure fire service. John T. Oakley, Commissioner of Water, Gas and Electricity Supply.

New York City (Manhattan).—John T. Oakley, Commissioner, has submitted plans to increase the city's water supply by 600,000,000 gallons per day, estimated to cost \$90,000,000; reservoir at Esopus creek, \$10,000; 70 miles of aqueduct to Bronx, \$35,000,000; reservoir for Brooklyn and Queens, \$7,200,000; aqueduct to Astoria, \$9,200,000; fees, etc., \$11,835,000.

Norfolk, Va.—It is reported that \$165,000 bonds have been sold for new water mains.

North Sydney, N. C.—City will borrow \$30,000 for water works and sewer system extensions.

Norwich, Conn.—Considering the issuance of \$60,000 water works improvement bonds.

Paw Paw, Ill.—Will construct a water tower, estimated at \$3,650.

Perth Amboy, N. J.—Plans have been prepared for a new intake at Runyon, estimated at \$3,500.

Princeton, Ky.—Considering issuance of \$40,000 bonds for the construction of water works. Vote will be taken on November 8.

Providence, R. I.—Estimated cost of pipe line from Providence to North Providence is \$25,000.

Redwood City, Cal.—\$35,000 bonds for water mains have recently been voted.

Sacramento, Cal.—\$25,000 is the estimated cost of new water mains; \$8,000 for suction pipe.

Salt Lake City, Utah.—Frank L. Hines, Superintendent of Water Works, has recommended the purchase and installation of 5,000 water meters.

St. Louis, Mo.—Reported that \$50,000 has been appropriated for the installation of water meters.

San Diego, Cal.—\$31,514 is the estimate that has been filed for pumping plant on Sexton Tract, Mission Valley.

Santa Ana, Cal.—Considering the extension of the water works to the amount of \$60,000.

Seattle, Wash.—May lay water main from Western avenue and Belt street to Interbay and Ross avenues, estimate \$75,000.

Tifton, Ga.—Will vote November 15 on issuing \$30,000 bonds for water works.

Toledo, O.—Ordinance has been signed to issue \$500,000 bonds for a purification plant.

Tryon, N. C.—Will vote on issuing \$20,000 bonds for a water works.

Union Springs, N. Y.—Preliminary estimates call for pumping stations at lake, 300,000-gallon reservoir and 5 miles of mains, estimated to cost \$36,000.

Vallejo, Cal.—Considering laying 8 miles of 14-inch cast-iron water pipe, at an estimated cost of \$106,000.

Waco, Tex.—Voted to sell \$306,000 bonds for a water works system.

Walpole, Mass.—Voted to lay water mains on Gill street, estimated to cost \$4,000.

Washington, Ga.—Engineer has been secured for the proposed \$30,000 water works system.

Wheeling, W. Va.—Ordinance for the purchase of a 20,000,000-gallon pumping engine has been presented to the city council.

Williamsburg, Miss.—Reported that city will issue \$14,000 bonds for water works construction.

Wilmington, Vt.—\$20,000 bonds have been voted for the installation of a water works.

Worcester, Mass.—Will lay 6,000 feet of 10-inch pipe on Plantation avenue, at a cost of \$12,056; will spend \$50,000 for repairs on Paxton reservoir, and \$10,000 for pipe improvements.

Zanesville, O.—Ordinance passed on first reading to issue \$300,000 filtration bonds.

CONTRACTS AWARDED (WATER SUPPLY).

Atlantic City, N. J.—Contract for 403 tons of cast-iron pipe—4 to 12 inches in diameter—at \$22.20 per ton, and 30,000 pounds of special castings at 2½ cents per pound, awarded to United States Cast Iron and Foundry Company, 80 Broadway, New York City.

Baltimore, Md.—Contract for masonry standpipe at Roland Park, awarded to John Stack & Sons, Maryland avenue, at \$12,000.

Bellaire, O.—Contract for intake at pumping station to Castoe & Warner, at \$9,200.

Berea, Ky.—Berea College, \$50,000 water works contract awarded to Gleaves & Co., Lynchburg, Va.

Cincinnati, O.—Contract for reservoirs at California, O., awarded to Keiling & Ridge, Pittsburg, Pa., at \$719,821. Contracts for water mains: Woolper and Clifton avenues and McAlpin and Lafayette streets, to F. H. Kirchner & Co., at \$9,819; Burnet avenue, Keeling & Rich, Pittsburg, Pa., at \$17,039.50; Forest avenue, G. M. Gest, \$11,531.50.

Coshocton, O.—Contract for 20-inch suction line to Michael Rabitt, The Nasby, Toledo, at \$7,600.

Danville, Va.—Contract for 2,000,000-gallon filter, to Pittsburg Filter Manufacturing Company, Pittsburg, Pa., at about \$10,000.

Emporia, Va.—Contract for water works awarded to E. L. Mathis, West Point, Va., at \$25,853.

Ft. Mead, S. Dak.—Contract for water system to Dwyer Plumbing and Heating Company, St. Paul, Minn., at \$26,000.

Houghton, Mich.—Contract for Huron Creek dam, to Johnson & Lattinal, at \$12,000.

Marshall, Mo.—Contract for water works system to G. Jaeger, Rich Hill, Mo., at \$19,840.

Milbank, S. Dak.—Contract for water works reported to have been awarded to Des Moines Bridge and Iron Works, Des Moines, Iowa, at \$18,860.

Newton, N. J.—Contract for storage reservoir, to Bell Engineering and Construction Company, 220 Broadway, New York City, at \$7,286.

Panama, Central America.—Isthmian Canal Commission reported to have let contract for cast-iron pipe and specials to United States Cast Iron Pipe and Foundry Company, New York City; 43,000 tons pipe at \$21.70 per ton, and specials, at 2½ cents per pound, f. o. b. Colon.

Portland, Ore.—Contract for water pipe, to United States Cast Iron Pipe and Foundry Company, New York, at about \$25,650.

Seattle, Wash.—Contracts awarded for pipe: Sunnyside avenue, \$1,291.50, and 20th avenue, \$2,689.20, both to Bell and Price, 13th avenue, \$16,823.30, to Stirrat & Goetz.

Toronto, Ont., Can.—Contract for laying 6-foot steel conduit from lake shore to Haulaus Crib, to Frank Simpson, at \$84,745.

Walsenburg, Colo.—Contract for water works to Holme & Allen Pipe and Construction Company, Denver, and T. J. and T. M. Murray, Trinidad, at \$66,427.

LIGHTING

Baltimore, Md.—Municipal Electric Commission will require 800,000 duct feet of material, estimated at \$200,000, to extend sub-way system.

Brunswick, Mo.—Plans are being prepared for the erection of an electric light plant.

Buford, Ga.—Bonds have been voted for the erection of an electric light plant.

Charlottetown, Prince Edward Isle., Can.—Plans are being prepared for the erection of a municipal electric light and power plant.

Cincinnati, O.—Electric lights will replace naphtha lamps, now used in Bond Hill section.

ENGINEERS, CONTRACTORS, Etc.

ENGAGED IN MUNICIPAL WORK

IOWA ENGINEERING COMPANY

CIVIL, HYDRAULIC AND SANITARY ENGINEERS

CHAS. P. CHASE, Pres. and Manager ARTHUR J. COX, Sec. and Treas.

410-411 Weston Block, CLINTON, IA.

SPECIALTIES: Water-Works, Sewerage and Sewage Disposal

Emil Kuichling, C. E.

Member of Am. S. C. E.

CONSULTING ENGINEER

52 Broadway, NEW YORK

Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.

CITY-WASTES DISPOSAL CO.

186 Fifth Avenue
NEW YORK

(Organized from the Staff of the late Col. George E. Waring, Jr.)

Consulting and Contracting in Sewerage, Sewage Disposal, Garbage and Refuse Disposal and Street Cleaning.

WISE & WATSON

CIVIL AND CONSULTING ENGINEERS

Passaic National Bank Building
PASSAIC, N. J.

COLIN R. WISE,
City Surveyor of Passaic, N. J.

ROBERT M. WATSON,
Borough Engineer of Rutherford,
N. J.

J. T. FANNING

CONSULTING ENGINEER

300 Hennepin Avenue
MINNEAPOLIS, MINN.

M. Am. Soc. C. E.

Plans for Public Water Supplies, Steam and Hydraulic Powers and Electric Power Transmissions.

Water Analysis and Methods of Filtration

JAMES M. CAIRD

Office and Laboratory: 271 River Street, TROY, N. Y.

The Municipal Engineering Company

(Incorporated)

Wall Street Exchange Building
41-43 WALL STREET, N. Y. CITY

Civil, Hydraulic, Sanitary and Electrical Engineers, Consulting, Designing Supervising and Contracting

SPECIALTIES

Water-Power Developments
Water Supply
Pumps and Pumping Plants
Irrigation Works
Heavy Masonry
Sewage Disposal
Garbage and Refuse Cremation

Rudolph Hering AND George W. Fuller

HYDRAULIC ENGINEERS AND
SANITARY EXPERTS

170 Broadway, NEW YORK

Water Supply, Water Purification, Water-Power, Sewerage and Sewage Disposal. Examinations of Projects, Plans, Specifications and Estimates of Cost.

Construction Superintended

Clinton, N. Y.—\$7,000 recently voted for the erection of a municipal electric light plant.

Detroit, Mich.—Considering spending \$111,500 for electric light plant improvements: One 2,300 h.-p. engine, one 1,500 h.-p. alternator, two new boilers, pipe and fittings, etc.

Durand, Mich.—\$6,000 electric light bonds have been sold, for work to be done in the future.

Ellensburg, Wash.—\$22,000 bonds have been sold recently for erection of electric light plant.

Eupora, Miss.—City will erect a \$10,000 electric light plant. All communications should be addressed to the mayor.

Ft. Wayne, Ind.—Will install two 400 h.-p. boilers in electric light plant.

Grass Valley, Ore.—Electric light plant that was recently acquired, will be enlarged; wants a 25 or 30 h.-p. gasoline engine and a 40 kilowatt dynamo.

Holyoke, Mass.—Considering the equipment of electric light plant to the extent of \$28,000.

Ilion, N. Y.—Bonds have recently been voted to improve electric light plant.

Little Rock, Ark.—Considering spending \$10,000 on electric light plant, which will include the erection of a brick addition and two new boilers.

Marshall, Mich.—Will install alternating-current system of lighting at an expense of \$2,800.

Milwaukee, Wis.—Reported that ordinance to issue \$150,000 electric light plant bonds has been signed.

Monrovia, Cal.—May vote \$15,000 bonds for electric light and power house. Trustee Williams, Chairman Water Commission.

New Albany, Miss.—Has engaged W. F. and A. D. Wilcox, Engineers, Jackson, Miss., to prepare plans for electric light plant.

New York City (Manhattan)—Armory Board will have a lighting plant, estimated at \$55,000, installed in new Seventh Regiment Armory.

Penn Yan, N. Y.—\$35,000 electric light plant bonds have been sold.

Pittsburg, Pa.—City Council has authorized the issuance of \$33,742 for improvements to electric light plant.

Richmond, Va.—Bids wanted soon on a 2,000,000-cubic foot gas tank, also on a \$40,000 gas pipe line.

Saginaw, Mich.—Estimates have been made for proposed municipal electric light plant: Building and stack, \$15,500; two 350-h.-p. water tube boilers, \$7,750; steam and water piping, \$2,000; air pump and condenser, \$1,000; surface type feed-water heater, \$1,000; boiler feed pump, \$200; low pressure service pump and tank, \$225; one 250-kilowatt, 60-cycle, revolving field, 2,300-volt, alternating generator, exciter on shaft, 150 R. P. M., \$6,500; one cross compound Corliss type, horizontal engine, direct connections, \$8,000; one 50-kilowatt, 60-cycle, revolving field, 2,300-volt generator to high speed automatic engine, 257 R. P. M., \$3,500; one switchboard, \$1,800; 500 enclosed arc lamps, hangers, etc., \$13,500; 500 mast arms, \$4,000; 4,500 pounds waterproof wire, \$5,850; 3,000 cedar poles, 50 feet high, \$54,000; 30,000 feet, 2-conductor marine cable or equal, \$1,800; 20,000 feet underground duct with cables, \$10,000.

St. John, N. B., Can.—City Council considering the purchase of the electric light plant that furnishes light for the west side of the city. At present they pay \$105 a light, per year, while if they owned the plant it would cost them about \$75 per year.

St. Joseph, Mo.—Ordinance has been introduced in the Council for the appropriation of \$76,869 for an electric light plant.

Hudson Engineering & Contracting Co.

92 William Street
New York

Bacon Patent Simple and Compound Air Lift Systems

Water Works and Artesian Well Systems Designed and Installed.

JOHN W. ALVORD

MEM. AM. SOC. C. E.

CONSULTING ENGINEER

1207 Hartford Bldg., CHICAGO

Hydraulics and Sanitation Works.
Water Supplies, Water Power, Sewerage, Sewage Disposal.

STEPHEN CHILD LANDSCAPE ARCHITECT AND CONSULTING ENGINEER

Warren Building, 2a Park St.
BOSTON, MASS.

S. B. Massachusetts Institute of Technology, 1888.
Member American Society of Civil Engineers.

Telephone Connection
Correspondence Solicited.

O. H. SHEFFIELD & CO. CIVIL ENGINEERS AND ARCHITECTS

518 Austell Building, ATLANTA, GA.

Railways

Water-Powers

Municipal Public Works

Bridges and Buildings

ELISHA GREGORY

CONTRACTOR FOR DRILLING ARTESIAN WELLS

123 Liberty Street, NEW YORK

Water Works, Filtration Systems POWER PLANTS

Brossmann & King, Engineers
Lemcke Building, Indianapolis, Ind.

WILLIAM B. EWING CIVIL AND CONSULTING ENGINEER

1003 Chamber of Commerce
CHICAGO, ILL.

MEM. AM. S. C. E. MEM. WEST. S. E.

For Hydraulic, Sanitary, and Municipal Works. Water Works, Sewerage Systems, Septic Tanks, Sewerage Purification, Water Power, Pavements, Bridges, Expert Concrete Construction, Expert Examinations and Reports.

If you do not find it in our advertising pages write us. Our Information Bureau is at your service.

Municipal Journal and Engineer.

Southern Creosoting Company, Ltd.

SLIDELL, LOUISIANA.

Located in the finest Long Leaf Yellow Pine District in the United States. Capacity 22,000,000 feet B. M. per annum.

Let's Speak Frankly

Those who think they can afford it, pay the "advertised price." Those who are not sure, investigate and calculate the cost. For example: take a typewriter,—\$100 is the "standard price"—well advertised. Yet we all know there is not one hundred dollars worth of value in any machine provided equal merit can be had at a less price. Waste has no place in the scheme of success.



The Chicago -- \$35

is the best machine at any price, and in purchasing it you save \$65.
Write for the reason why.

CHICAGO WRITING MACHINE CO.
94-96 WENDELL ST., CHICAGO, ILL.

JUST PUBLISHED

REINFORCED CONCRETE

BY

CHARLES F. MARSH

545 Pages - 512 Illustrations

PRICE, \$7.00 NET

Municipal Journal Publishing Co.

253 BROADWAY, NEW YORK

W. H. SCHOTT ENGINEER

Marquette Building
CHICAGO

STREET RAILWAYS FINANCED AND BUILT COMPLETE

Designer and Builder
CENTRAL STATION
HEATING, GAS,
ELECTRIC LIGHT
and POWER PLANTS

Contractors' Equipment Company

BETZ BUILDING,
PHILADELPHIA.

Steam Road Rollers, Road
Machines, Crushers, Sprinkling,
Sanding, Dump and Distributing
Wagons, Road Making and Con-
tractors' Plant of every description.
Our list for the asking. Cor-
respondence solicited.

W. R. CONARD Inspector of Iron Castings

Including: Building, Bridge and Sewer Castings, Valves and Hydrants.
SPECIALTY: Water and Gas Pipe and Specials for same.

1004 High Street, Burlington, N. J.

Sewer Construction AND PIPE LAYING TOOLS A SPECIALTY

Write for Catalog
J. G. POLLARD
141 Raymond Street
BROOKLYN, N. Y.

THOMAS HAWKES LANDSCAPE ARCHITECT

1532 Monmouth Block
CHICAGO

Designs Prepared for Parks, Cem-
eteries, Private Estates, Subdivis-
ions, &c.

Correspondence Solicited
Tel., Harrison 3652

J. W. HOWARD, C. E., 1 Broadway, New York

In person or by mail. 23 years experience.
Full equipped laboratory.

Paving materials, Machinery, Men, Companies, Specifications, Formulae, Analyses, Litigation.

Information, Inspection, Reports, Asphalt and other Pavements

U. S. MAIL CHUTES

The Cutler Patent Mailing System
installed by the Sole Makers.

THE CUTLER MFG. CO., Rochester, N. Y.

D. P. REGAN & MULLOCK Electrical Subway Contractors

4402 Chestnut St., Phila., Pa.
and Atlantic City, New Jersey

**More than 14 Years' Experience Exclusively
in this Line in Europe and America.**

PATENTS

promptly obtained **OR NO FEE.** Trade-Marks, Caveats, Copyrights and Labels registered. **TWENTY YEARS' PRACTICE.** Highest references. Send model, sketch or photo. for free report on patentability. All business confidential. **HAND-BOOK FREE.** Explains everything. Tells How to Obtain and Sell Patents, What Inventions Will Pay, How to Get a Partner, explains best mechanical movements, and contains 300 other subjects of importance to inventors. Address: **H. B. WILLSON & CO., PATENT ATTORNEYS.**

871 F STREET, N. W., WASHINGTON D. C.